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ABSTRACT

Provided in this annual report, the 10th of a series, are the texts of four papers presented at a preconference workshop on new directions for infancy research. The papers focus on the middle European contribution to infancy research, main themes in European research on infant perception and cognition, an innovative therapeutic approach to establishing emotional mutuality in Japanese cases of interactional failure in early infancy, and new directions for infancy research. Also included in the report are three related articles focusing on a dynamic systems approach to the development of the organization of infant crying, expressive behavior of Japanese mothers in response to their 5-month-old infants' negative and positive expression of emotion, and behavioral inhibition and social experience of 12-month-old infants. Also provided are the preconference's opening statement by Kazuo Miyake, Director of the Research and Clinical Center for Child Development, Faculty of Education, Hokkaido University, the workshop schedule, and reflections on the workshop by Sing-jen Chen, also of Hokkaido University's Faculty of Education. (RH)

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FACULTY OF EDUCATION
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Sapporo, Japan

RESEARCH AND CLINICAL CENTER FOR CHILD DEVELOPMENT

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Assistant Editor : Shing-jen Chen

CONTENTS

SPECIAL SECTION ON PRE-CONFERENCE WORKSHOP, ISSBD 1987

Pre-Conference Workshop, ISSBD 1987 1
Kazuo Miyake, and Shing-jen Chen

The Middle European Contribution to Infancy Research 9
Hanuš Papoušek

Main Themes in European Research on
Infant Perception and Cognition 21
George Butterworth

Establishing Emotional Mutuality in Japanese Cases 37
Hisako Watanabe

Comments on Pre-Conference Workshop: New Directions
for Infancy Research 45
Rchard Q. Bell

ARTICLES

The Development of The Organization of Infant Crying:
A Dynamic Systems Approach.....49
Shing-jen Chen

Expressive Behavior of Japanese Mothers in Response to
Their 5-Month-Old Infants' Negative and Positive Emotion Expression.....55
Yuko Kanaya, Donna L. Bradshaw, Kazuo Miyake,
and Chiaki Nakamura

Behavioral Inhibition and Social Experience of
12-Month-Old Infants 61
Yoshinobu Takahashi

目　　次

1．国際行動発達学会第9回大会プリ・カンファレンス・ワークショップについて…… 1
三宅和夫，陳　省仁

2．中央ヨーロッパにおける乳児研究の流れ…… 9
ハヌス・パブシェック

3．ヨーロッパにおける乳児の知覚・認知研究について……21
ジョージ・バタワース

4．情緒的相互関係の確立―日本の母子について―……37
渡辺久子

5．プリ・カンファレンス・ワークショップ所感……45
リチャード・ベル

6．ダイナミック・システムズの視点から見た乳児の「泣き」の発達……49
陳　省仁

7．5か月児の情動表出に対する日本の母親の応答……55
金谷有子，ドナ・ブラッドショウ，中村千晶，三宅和夫

8．12か月児の行動抑制傾向と社会的経験……61
高橋義信

PRE-CONFERENCE WORKSHOP, ISSBD 1987

Opening Address by Kazuo Miyake, Director of RCCCD

Although recent years see an increase in the number of Japanese infant studies, it has to be admitted that in this country the state of the art in this field is still in its infancy. A coming of age will not be in sight for some time without a more consistent and systematic effort on this relatively new field. In proposing this workshop, it was hoped that one small step in the progress toward a more exciting state of affairs for infant studies in Japan could be made by providing a good opportunity for interaction of not only researchers from different countries in the field, but also for researchers from different disciplines. Here in this workshop, as we would have a much smaller group than what will be expected for the Conference proper in Tokyo, I am certain that we would be able to benefit from a more intimate, face to face interaction.

Current Research Activities of RCCCD

The general objective of the research activities at RCCCD is to elucidate the process of socialization in infancy and early childhood, specifically the factors underlying the development of individual as well as cultural variations in attachment, compliance, emotional expression, and other forms of social behavior. To attain this objective we have conducted a couple of longitudinal studies starting from newborn period to preschool years.

The theoretical framework of our research emphasizes the interaction of early temperamental dispositions with maternal mode of interaction in the establishment of individual differences in socio-emotional development. Our finding so far indicates the possibility of a temperamental disposition toward irritability and fearfulness in the first year that could make a considerable contribution to the variations observed in the attachment classification. It is shown that what is called " security of attachment " reflects, at least partly, a temperamental disposition to become irritable and fearful. It is also suggested that temperamental and maternal variables are likely to interact to determine the pattern of attachment behavior. It is found that major differences exist in Strange Situation performance of our one-year-old infants relative to those in the United States.

We also found the existence of major differences in Strange Situation performance of our one-year-old infants relative to those in the United States. Specifically, Japanese infants were overrepresented in the C(resistant) classification and underepresented in A (avoidant) classification. Our findings seem to indicate that the Strange Situation created a distress so intense in some Japanese infants that they could not easily recover from the distress even by reunion with their mothers.

We know that Japanese customs encourage close physical proximity between mother and infant and infrequent exposure to strange adults. Moreover, the emphasis on dependence in our culture undoubtedly increases our infants' showing distress when separ-

ated from their mothers. Hence, the ideas about attachment as assessed by the Strange Situation procedure are challenged by our infants and mothers. Assuming the preferred patterns of mother-infant interaction in our culture, what Ainsworth attachment classification means must change. In this connection, Hinde (1982) clearly pointed out the fallacy of viewing a single pattern of mother-infant relationship as adaptive:

> The picture of an environment of evolutionary adaptedness serves well enough as a first stage in our thinking. But as we go beyond that, we must accept that individuals differ and society is complex, and that mothers and babies will be programmed not simply to form one sort of relationship but a range of possible relationships according to circumstances. So we must be concerned not with normal mothers and deviant mothers but with a range of styles and a capacity to select appropriately between them .... At one level of approximation, there are general properties of mothering necessary whatever the circumstances. At a more precise level, the optimal mothering behavior will differ according to the sex of the infant, its ordinal position in the family, its mother's social status, caregiving contributions from other family members, the state of physical resources, and so on. Natural selection must surely have operated to produce conditional maternal strategies, not stereotypy.

While preparing for publishing a final report of the research stated above, our research team has launched on the study of the socialization of emotion in infancy and communication style between mother and infant in close collaboration with Professor Campos of the University of Illinois at Urbana/Champaign and his research team.

It has been hypothesized by anthropologists and psychiatrists that the nonverbal communication style and the underlying attitudes of Japanese mother account for the profound differences in subsequent personality, socialized affects (e. g. pride and shame) and group behaviors existing between American and Japanese children. Confirmation of these hypotheses is one of the significant areas of our research.

As a first step toward this goal, a series of lab observations was carried out comparing American and Japanese mothers' style of communication when prohibiting their 23-months-old infants from touching attractive objects. Preliminary findings from this study demonstrate that the Japanese mothers seem to be more inhibited to use harsh tone of voice and less verbal. They are somewhat less persistent in their restriction of their infants. Cultural differences in the infants' readiness to comply whth maternal prohibition also appear likely. We hope not only to elucidate cultural differences, but also common processes of emotional communication that are significant in influencing subsequent child behavior.

Secondly, a longitudinal research is underway currently in order to investigate how both socialization and temperamental dispositions lead to early individual and cultural differences in emotional behavior and expression. We believe this kind of study can help illuminate the processes through which early social influence modifies, extends, or overrides emotional development.

With some 40 mothers and their infants living in Sapporo as our subjects, a home observation was conducted which included not only observations of natural interaction between mother and her 5-month-old infant, but also several controlled procedures

designed to elicit emotional interchange between the two or emotional reactions from the infant. At 12 months of the infant age the same mother-infant pairs were invited to our lab. In this lab observations were included assessments of the infant's temperamentally-based tendency to become inhibited when faced with unfamiliar events, expressions of smiling and laughter, fear, and anger to a variety of social and nonsocial stimuli, reaction to maternal prohibitions, and responsiveness to posed emotional expressions. Parallel observations of the mother-infant interaction at 5 months of age are underway in Champaign, Illinois, and the assessments at 12 months of age are scheduled for spring 1988.

The analysis of the data from the observations stated above allows us to examine the developmental influences of mother's style and infant temperament as well as stability and change in early emotional development from a cross-cultural point of view.

We regard this study as a preliminary one, and I entertain the hope that more elaborate design will be employed in our future studies to assess both infant and mother characteristics in and outside of interactional contexts beginning from newborn period in order to better comprehend the contributions of mother and infant to emotional interchange and development.

The Program

NEW DIRECTONS FOR INFANCY RESEARCH

Thursday, 9 July	
10 : 30～13 : 30	Registration
11 : 30～12 : 30	Opening Session
	Greetings
	Chairperson : Chen, Shing-jen
	Address : Miyake, Kazuo
12 : 30～13 : 30	Lunch
13 : 30～14 : 45	Address : Papoušek, Hanuš
	"The Middle European Contributions to Infant Research"
14 : 45～15 : 00	Coffee Break
15 : 00～16 : 30	Address : Butterworth, George
	"Main Themes in European Research on Infant Perception and Cognition"
16 : 30～17 : 20	Open House
	Research and Clinical Center for Child Development
18 : 00～	Reception at Pekeretto Lake Park
Friday, 10 July	
9 : 30～12 : 30	Plenary Session
	Panel Discussion
	Chairperson : Bell, Richard
	Speakers :
	1. Beller, Kuno

	"Cultural and Situational Correlates of Infant Temperament"
	2. Fogel, Alan "A Dynamic Systems Approach to Infant Development: Theory and Research Strategies"
	3. Lipsitt, Lewis "Hedonic Mediation of Self-Regulatory Behavior in Infants"
	4. Okonogi, Keigo & Watanabe, Hisako "The Importance of Infancy Research: Psychiatric Point of View"
12 : 30～13 : 30	Lunch
13 : 30～14 : 30	Address: Kobayasi, Noboru "Significance of Infant Research in Pediatrics"
14 : 30～14 : 45	Coffee Break
14 : 45～17 : 00	Discussion Session
	a) Newborn Chairpersons: Bell, Richard & Chen, Shing-jen
	b) Cognition, perception Chairpersons: Cohen, Annabel & Wakai, Kunio
	c) Socio-emotional development Chairpersons: Grossmann, Klaus & Takahashi, Michiko

Saturday, 11 July

9 : 30～10 : 15	Reports by Discussion Chairpersons
10 : 15～11 : 45	Discussion Session
11 : 45～12 : 00	Closing Remarks

List of participants

Participants from Abroad

Name (family, given)	*Affiliation*	*Area of Interests or Specialty*
Ashkenazi, Zafrira	Children's Diagnostic and Rehabilitation Center, Beer-Sheva, Israel	Culture and childrearing; infant stimulation programs
Bell, Richard	Department of Psychology, University of Virginia, U. S. A.	Reciprocal socialization; genetic factors
Beller, E. Kuno	Department of Social Education—Early Education, Berlin Free University, F. R. G.	Conflict moderation; daycare; infant attachment
Butterworth, George	Department of Psychology, University of Stirling, Scotland	Origins of thought & language; joint visual attention
Cohen, Annabel	Center for Research in Human Development, Erindale College, Univerity of Toronto, Canada	Memory and perception; infant hearing
Fogel, Alan	Department of Child Development and Family Studies, Purdue University, U. S. A.	Social & communicative development; dynamic systems view

Grossmann, Karin	Department of Psychology, Regensburg University, F. R. G.	Attachment : comparative, in relation to illness
Grossmann, Klaus E.	Department of Psychology, Regensburg University, F. R. G.	Lifespan attachment ; precursors of attachment
Hwang, Philip	Department of Psychology, Gothenburg University, Sweden	Parent-infant relations ; role of father
Lipsitt, Lewis	Department of Psychology, Brown University, U. S. A.	Sensory & learning processes ; early experience
Morgan, George	Department of Human Development and Family Studies, Colorado State University, U. S. A.	Mastery motivation
Papoušek, Hanuš	Max Planck Institute for Psychiatry, F. R. G.	Pediatrics/Developmental psychobiology ; parent-infant interaction
Papoušek, Mechtild	Max Planck Institute for Psychiatry, F. R. G.	Psychiatry/Developmental psychobiology ; parent-infant interaction
Stevenson, Marguerite	School of Family Resources and Consumer Sciences, University of Wisconsin, Madison U. S. A.	Contingent responsiveness & language, social, & cognitive skills.

Participants from Japan

Name (family, given)	*Affiliation*	*Area of Interests or Specialty*
Itoigawa, Naosuke	Osaka University Department of Human Sciences	Ethology, Developmental psychology
Ōtaki, Midori	Jōetsu University of Education	Attachment
Ōhama, Kikuko	Komazawa University Department of Literature	Language acquisition & interaction
Okonogi, Keigo	Keio University Medical School	Psychiatry
Katō, Tadaaki	Nippon Aiiku Research Institute for Maternal-Child Health & Welfare	Pediatrics/Mother-infant interaction
Kohzuma, Shirō	Tokyo University Medical School	Obstetrics
Kobayashi, Noboru	National Children's Hospital	Pediatrics/Infant behavior
Takahashi, Michiko	Tokyo Gakugei University	Social interaction, Attachment
Nakamura, Kou	Sapporo Medical College Psychology Area	Newborn visual perception
Hamada, Yōko	Keio University Medical School	Infant psychiatry
Fujisaki, Machiyo	Gunma University Department of Education	Developmental psychology/Longitudinal study
Maekawa, Kihei	Tokyo Jikei Medical College	Pediatrics

Mizukami, Keiko	National Children's Hospital Medical Research Center	Mother-infant interaction ; neonatal behavior
Yamaguchi, Hiroko	Shiraume Gakuen Junior College	Cognitive development ; symbolic play
Wakai, Kunio	Kobe University	Family interaction & cognitive development ; learning
Wakaba, Yōko	Tokyo Gakugei University	Psychology of handicapped children
Watanabe, Hisako	Yokohama City Hospital	Psychiatry
Isshiki, Nobuo	NHK Broadcasting Corporation	TV Director
Yamashita, Itaru	Hokkaido University School of Medicine	Psychiatry
Shitara, Masayo	Sapporo City Hospital Division of Child Psychiatry	Child psychiatry
Mizuno, Kazuko	Sapporo City Hospital Division of Child Psychiatry	Child psychiatry
Fukuyama, Keiko	Kinikyo Hospital Pediatric Section	Pediatrics
Onishi, Michiko	Otani Women's College	Child development
Miyamoto, Minoru	Hokkai Gakuen University	Child clinical psychology
Miyake, Kazuo	Hokkaido University Facalty of Education	Early socialization ; parent-child interaction
Chen, Shing-jen	Hokkaido University Facalty of Education	Newborn & infant behavior development
Seki, Michiko	Hokkaido University Facalty of Education	Socialization ; preschool education
Furutsuka, Takashi	Hokkaido University Facalty of Education	Physiological psychology ; premature infant development
Nakano, Shigeru	Fuji Women's Junior College	Children's play
Kanaya, Yūko	Kokugakuin Junior College	Mother-infant interaction ; temperament
Usui, Hiroshi	Hokkaido University of Education	Cognitive style ; personality development
Satō, Kimiharu	Hokkaido University of Education	Perception & cognition
Kojima, Yasuji	Sapporo University	Cognitive development ; social interaction
Aoki, Mari	Hokkaido University of Education	Mother-infant interaction ; personality development
Bradshaw, Donna	Visiting Research Fellow	Emotion socialization ; emotion communication

Takahashi, Yoshinobu	Doctoral program student	Cognitive development
Nakamura, Chiaki	Master's program student	Mother-infant affective interaction
Matsumot, Mayumi	Master's program student	Mother-infant interaction
Kusanagi, Emiko	Research student	Temperament
Ōtaki, Mariko	Research Student	Mother-infant interaction
Tamura, Aoi	Graduate of master program	Mother-infant interaction & crying

Reflections on the Workshop

As Dr. R. Bell has provided us with a general comments on the workshop as a whole, repetition will be avoided. A few points will be recorded here to serve as a memorandum to which we can return to when we want to confirm or to review the course of progress in our research and thinking on behavioral development in the future.

1. Both in preparing for the workshop as well as in participating in the interaction, it is felt that a great deal has been learned. We hope that all the participants would agree with us on this, although we are not completely sure this was the case. From the point of view of a beneficiary, one of the most valuable experiences was perhaps the opportunity to meet scholars from countires with different traditions concerning the approaches to our common problems, and this without our going. It was also felt that though a small group of no more than forty researchers, we had one of the best selection. The valuable experience of listening and conversing with the masters was in front of us for picking.

2. The importance of systematic description and the fact that it can be achieved without fancy instrumentation were demonstrated to us more than once during the workshop. This corrected our unconcious belief that experiment took place only in the lab, and modified it with a new one which says that experiment takes place first in researcher's head. We were very much impressed by the simiplictiy with which problems were formulated and solved, and data shown.

3. One more point in terms of the source of information and inspiration for future research to be remarked on is the emphasis on evolutionary biology. This was true not only at the workshop, but also at the conference too, and in the literature in general. It is hoped that this workshop will serve as a starting point for many of us in doing our home work for future research in behavioral development. (Shing-jen Chen)

THE MIDDLE EUROPEAN CONTRIBUTION TO INFANCY RESEARCH

Hanuš Papoušek
Max-Planck Institute for Research in Psychiatry

Modern forms of close international cooperation—from which infancy research has profited more than other scientific disciplines—have made it difficult to delineate geographical entities in research. Crossing boarders for conferences, for sabbatical years, or for ever has become a regular part of life among scientists. It is necessary to unravel deeper historical roots in order to detect geographical differences in scientific theories, concepts or methods. I have no other qualification for historical excursions than my Middle European origin and my own participation in infancy research. However, these two circumstances alone—each for a particular reason—sufficiently motivate for interest in history. Middle Europe has always challenged historians due to the complexity of past political and cultural currents. Conversely, care for infants—to say nothing about infancy research born as late as the present century—is interesting as an aspect which, in spite of its general importance, has attracted almost no attention in former historical documents. The story of Herodes the Great who is believed to have ordered to murder infants at the time of Christ's birth may be an exception, however, it is not a European story. Otherwise, infancy and childhood had to wait until the Age of Enlightenment for some public interest. Historical events prior to Enlightenment require some attention for other reasons; they help understand the complexity of Middle European circumstances.

Middle Europe prior to Enlightenment

A Japanese visitor to Europe may be amazed by the number of small countries and separatistic movements within them. Attempts to unite Europe for the sake of more effective competition with other large countries belong to the most difficult political problems. To understand the complexity it is necessary to realize that, for centuries, natural resources, mild climate, minimal volcanic activities, and advantageous water routes in Middle Europe have lured both peaceful nomadic nations seeking after fertile land back from overpopulated areas, and the rulers of major nations searching for more territory, resources, and vassals.

Since about 1800 BC, Europe witnessed migrations of Neolithic cultures from the East, the Celtic La Tene culture during the Early Iron Age, including the Halstatt culture, and the so called Urnfield cultures during Early Bronze Age. Between 1200 and 1100 BC,

This paper is based on an invited address at the 1987 ISSBD Pre-Conference Workshop: "New Directions for Infancy Research." Requests for reprints should be addressed to Hanuš Papoušek, M. D., Sc. D., Professor of Developmental Psychobiology, Max-Planck Institute for Research in Psychiatry, Kraepelin Str. 10-EPB, D 8000 Munich 40, F. R. Germany.

Celtic civilization spread over Europe and crossed even the natural boarder between Middle and South Europe, the Alps. A few centuries later, Thraco-Cimmerian warriors with Late Bronze cultures migrated to Europe from the East whereas from Greece the Scythians invaded in response to attacks of Celtic raiders.

The further development of Middle Europe was strongly influenced by the migration of Germans, Kimbers, Teutons and Markomans from the Northern Europe southwards, and by Roman attempts to colonize Europe North of the Alps. Rome is believed to be founded in 750 BC, and during the first North-South migration in Europe, the expansive growth of the Roman Empire already conflicted with Gallic interests along the northern boarders. Provoked by Hannibal's sttack across the Alps against Rome (218 BC) during the Punic wars, and the later threat by Teutons (121 BC), Roman dictators felt compelled to build and fortify safe roads through the Alps and colonize the regions North of the Alps. Caesar's (57 BC) and Augustun's (26 BC) expeditions in particular contributed to the penetration of Roman civilization and disintegration of the Celtic La Tène culture.

In spite of initial military success, the Roman colonization to the North of the Alps met increasing difficulties under the pressure of further migrations from Northern Europe (Goths, Burgunds, Heruls, Sarmats, Franks, and Alamans), revolts in Gallic provinces, and the first major epidemy of plague brought in from North Africa in 252 AC. The stability of the Roman Empire deteriorated as evident in the fact that Roman emperors changed twelve times during two decades. In 340 AC, the Roman Empire split into two parts. The Western part then collapsed in 475 AC, to a great degree due to the Teutonic threat from the North and the additional invasion of Mongolian Huns under Attila's leadership about 450 AC. During those times, Middle Europe probably resembled a crossing with a chaotic traffic.

Slavic nations were the next to penetrate from the East to Middle Europe and to create new political entities. About 800 AC the Normans migrated from overpopulated Norway as far southwards as the Mediterranean sea. One century later, the Ungroffinnish tribes intruded to East and Middle Europe from Uralian areas, and Hungarians soon attacked neighbors in other parts of Europe. About the end of the first millennium AD, migrations slowed down, and the structure of Middle Europe indicated the future location of the present countries—Germany, Poland, Russia, Czechoslovakia, Hungary, Austria, and Switzerland.

Acculturation followed the struggles for territories and was closely connected with Christianization. Whereas Paris had had a bishopric since 250 AD and was christianized by St. Dionysis from Rome, dioceses in Middle Europe were founded later under Byzantine supervision, for instance, in Prague in 975 and in Moravia (Olomouc) in 1063. The establishment of royal dynasties with growing administrations and the increasing power of church brought about a rapid development of urban centers, architecture and arts, universities with educational systems for privileged classes, and the first scientific institutions. In the same vein, however, the gap between privileged and lower classes increased. People, often whole nations, were treated as articles of merchandise, sold or exchanged as parts of marital arrangements, donations, or tributes. Wars did not stop, only the reasons changed; wars became almost a matter of fashions and display of power. Christian church utilized the Zeitgeist and organized five crusades against Turks and Arabs

in order to liberate Jerusalem between 1096 and 1228 AD.

The costs were disastrous; the crusades brought not only an enormous financial burden causing a moral disintegration of church but also apocalyptic epidemies. First came an epidemy of lepra in 1231, and then the "blake plague" in 1348 which cost 25 million lives, i.e., one third of the entire European population. England lost one half of its population. The plague spread particularly among urban population, due to poor hygiene in overcrowded cities. Unfinished gothic cathedrals in several European cities remind today's visitors of tragic dimensions of the costs. No wonder that social tensions increased to a degree calling for fundamental changes in social systems.

Legislative documents reveal that Middle European nations were ruled and administered with minimal attention to individual freedom and social needs of citizens except the privileged class in power. The Roman justice which considerably influenced the Middle European legislation exemplifies a horrible picture of ignorance and neglect in relation to child care in weak attempts to reduce the misuse of children. For instance, it prohibited the mutilation of foundlings in order to use them as more efficient beggars. Rearing abandoned children and selling them as slaves or prostitutes was obviously tolerated in antique Rome. Later on, in 1212 and 1213, a Children's Holy Crusade was organized for liberation of Jerusalem, however, thousands of children were in fact sold as slaves after arrival in Mediterranian harbors. We may ask whether humans were still only poorly humanized animals or already humans so strongly dehumanized due to civilization as long as the organization of social systems paid so little attention to altruitsic aspects of human coexistence.

Reformatory Movements and Enlightenment in Middle Europe

The care for progeny is a prototype of altruistic forms of social behavior. However, attentiveness to altruistic, prosocial forms of social coexistence seems to the author to be unevenly distributed between intellectual or artistic parts of populations, and possessors or administrators of physical forces. In comparison to the role of prominent rulers or the role of class conflicts in the processes of historical decisions, the dichotomy between altruistic and egocentric forms of leadership has drawn less attention although it may be particularly interesting in relation to the history of child care.

Leadership based upon intellectual capacities and reasoning prefers peaceful coexistence, profits from exchange of information and collective decisions, has no reason for hiding intentions, requires criticism, respects individual rights and freedom. It may fail in military engagements but achieve cultural progress in scientific or artistic sense, and thus it stands for humanism. Conversely, leadership based upon physical power, be it individual strength or possession of weapons, property, or high social ranks, tends to pursue egocentric enrichment, territorial expansion, personal or national dominance. Consequently, it prefers hiding true intentions, requires blind obediance, avoids or persecutes criticism, and is little interested in rights and needs of lower ranking or underprivileged individuals. The dichotomy may be of a psychobiological or temperamental origin, and may change during development, both individual and cultural. Social systems may thus mature towards more democracy, humanistic coexistence and cooperation, scientific and artistic progress, and towards less military expansivity and autocratic types of

governments.

The Middle European societies obviously reached the turning-point in direction towards democracy and altruism during the Age of Enlightenment. However, precursors of Enlightenment appeared already at the end of the XIV th century, for instance in connection with the Hussite reformatory movement in Bohemia (the Western part of the present Czechoslovakia).

Having lost their own Bohemian royal dynasty of Přemysls the Czechs invited the Luxemburg dynasty to rule Bohemia. When Charles IV had been crowned both as the king of Bohemia and the German emperor in 1347 Prague became the cultural centre of Middle Europe attracting outstanding scientists and artists, particularly since the foundation of the Charles University in 1368. As a rather liberal and educated ruler, Charles IV acknowledged manysided privileges to lower nobility and to bourgeoisie thus increasing democratic elements in the government. University academia soon played a central role in efforts to reform the corrupt church and change the social structure in favor of underprivileged classes.

After the death of Charles IV, the reformatory movement under the leadership of John Hus seized the majority of Bohemian population and threatened the stability of church hierarchy and neighboring regimes. The conservative church hierarchy responded forcibly: John Hus was declared heretic and burnt alive in Constance in 1415, and crusades were organized to suppress the Hussite reformation. Militarily, the Hussite comunity resisted successfully against crusades for decades, however, it could not resist against internal split in Czech nobility and bourgeoisie. Finally, the Hussite army was defeated, Bohemia lost freedom under foreign monarchies in 1621, and the entire reformatory movement was forcibly persecuted. More than 100,000 Czech and Moravian citizens emigrated in order to live in religious and intellectual freedom. In spite of that, the movement facilitated the later success of Luther's reformation in Germany and Calvin's reformation in Western Europe.

The Hussite movement is worth mentioning due to reforms concerning child care and education. At its height it practiced equal rights for men and women, and free education for children from all classes. The Hussite king George from Podebrady elaborated the first concept of Peace Agreement for contemporary governments thus preceding later efforts of Erasmus from Rotterdam. The movement distinctly exemplified the significance of intellectual leadership for enforcement of altruistic principles in social systems, and conversely, the hard resistance in the possessors of power against all such attempts. Moreover, the movement gave mankind an outstanding personality raising new fundamentals of child care and rearing during the Age of Enlightenment, namly, Jan Amos Comenius.

Comenius, the bishop of the Moravian Brothers, was compelled as a Protestant to spend his most productive years in exile. The cruelty of the Thirty-Year-War and recurrent epidemics in Central Europe hardened his decision to propagate humanism and rationalism, and to do so mainly by improving child education. Comenius's work "Opera Didactica Omnia" (1657) represents the pillars of didactics. Comenius was unique at his time in the belief that educational care should begin in infancy, and be based upon parental interventions and playfulness as stressed in the works "Schola Materni Gremii," and

"Schola Ludus." In "Orbis pictus," Comenius gave children the first picture book for learning languages which quickly became the first educational best seller. He required a proper balance between health care and education, and recommended a special education for mentally retarded children, a measure which had to wait 200 years to be understood and realized. As one of the most prominent Enlightenment academicians, Comenius participated at the foundation of Royal Academies of Sciences in France and England, and helped to reform the educational system in Sweden.

Comenius's exile and international engagement illustrates an increasing tolerance between European nations in cultural areas, and an increasing solidarity in pursuing humanistic ideas during the Age of Enlightenment. Although not yet properly organized, a new intellectual leadership gradually emerged from the growing communities of scientists and artists as a counterbalance to autocracy. Hellenic standards of democracy and harmony beween bodily efficiency and spiritual nobility were on the way of gaining new appreciation as antidotes against the lust of power which was becoming evident even in the Roman church.

The clergy disliked that development, however, it became increasingly difficult to act against the leading scientists, and not to profit from their discoveries. For instance, the extensive discoveries in astronomy and geography contradicted the dominating Christian ideology on the one hand but opened new ways for colonization and enrichment to both church and governments on the other. Ideological contradictions gained upsetting dimensions. In fact, the propagation of Christianity legitimized the import of black slaves from Africa or the murdering of American Indians by conquistadors. The respect to humanity and children's needs certainly increased during Enlightenment, however, only very little changed in the legislation. The misuse of children may have decreased in Europe but florished in colonies where religious intolerance enforced racial prejudices and facilitated exploitation and genocides.

During the Age of Enlightenment, development of sciences was speeded up by methodological inventions allowing exact measurements, particularly in physics and astronomy. The progress in sciences soon brought about changes in the general way of thinking which can be characterized as a detachment from philosophy in general, and averting from Aristotelian concepts in particular.

Philosophy at that time was dominated by Ptolemy's geocentric view of the Universe, and Aristotle's essentialistic way of classifying phenomena and attributing them idealistic values. Thus, circular and rectilinear movements represented heavenly perfect forms of movements and terrestrial deviations from them mere effects of disturbances. Nature was viewed anthropomorphistically with animals being imperfect humans, and children imperfect adults. Dualistic views of man as a person consisting of a mortal body and immortal spirit-a conglomerate of ideas—left no space for mundane interventions in the sake of a better mental development and health. Individuality as a deviation from the ideal deserved minimal attention.

When the Polish astronomer Nicolaus Copernicus explained in "De Revolutionibus Orbium Celestium" in 1543 that Ptolemy was wrong and that Earth is a planet of the sun he in fact demonstrated that sciences should rely upon exact measurements rather than dogmatic beliefs. His measurements had to be corrected with improved techniques by

Johannes Kepler at the Prague Castle, however, the conclusions were confirmed. Kepler's "Astronomia nova" (1609) outlined a picture of the Universe which was very different from the interpretation used by the Roman church.

With respect to the significance for further scientific progress it may be difficult nowadays to understand why a scientific discovery should be condemned if it disproves a religious dogma. However, the Roman pope prohibited the new astronomic theory as soon as Galileo Galilei acknowledged and eloquently propagated it in public in Italy in 1610. Among other things, the pope's step reconfirmed how difficult it may be for possessors and administrators of power to cope with revolutionary innovations either in sciences or in social systems.

It is partly understandable that for administration and legislation at that time it was a nightmare to cope with the dynamics of cultural and political changes in Middle Europe. Accumulation of property and power required a perfect administration which at that time could only be facilitated by availability of clearcut classifications, stable criteria and values. Unknowingly, rulers and administrators were probably becoming empirical followers of Aristotle independently of their real education in philosophy, and enforced the conservative tendency to dogmatize convenient principles, values, and criteria. The clerus of Roman church showed the same tendency while becoming a large body of political and economical power on the European stage and departing from the original forms of Chrstianity as of an altruistic religion of the proletariat.

That development did not occur without ambivalence. While Charlemagne ruled France (768-814), for instance, he ordered bishops to open access to fundamental education to all social classes in the monastery and cathedral schools. Similar efforts made by Enlightment scholars in Middle Europe met administrative resistance and fear of potential social revolutions as a consequence of liberalism. Jean Jacques Rousseau's book "Emil" recommending a return to naturalistic forms of child rearing and education was ordered by Parliament to be burnt in public in 1762. The Swiss follower of Rousseau and founder of an institution for poverty children in 1798, Johann Heinrich Pestalozzi met hard resistance in the Prussian admintration. His German student Friedrich Fröbel who opened the first "Kindergarten" for 1-to-6-year olds in 1839—a model for the modern German system of preschool education—and whose interpretation of human child education already included a core of the later biogenetic principle made a similar experience; his system was prohibited in Prussia.

Thus, in general, the first steps of sciences towards a political and theoretical emancipation were not much more than a beginning of a long and difficult process continuing till nowadays. The differences between essentialistic Aristotelian and Galilean approaches have represented complex problems to scientists themselves as particularly evident in concepts on child development, according to Kurt Lewin's warnings from 1931. The next section of this presentation will discuss those problems in more details.

Altogether the mentioned circumstances help to explain the relatively slow scientific progress in terms of early human development. The interest in child development may be mainly motivated by three aspects: (1) the parental tendency to provide all possible support for the survival and optimal adaptation of the progeny; (2) the interest of the social system in a proper social integration of the progeny as an assumption for a smooth

functioning of the system ; (3) the individual or cultural need to enrich the knowledge on the origin and development of man. Doubtlessly there used to be good and bad parents in the past very much like nowadays, and the long history of cultural achievements has proved that the past generations of parents knew well how to rear children provided that child development has not entirely been governed by genetic mechanisms. The social control and scientific understanding of the developmental procees represent more complex questions.

According to the author's opinion, the social control of interventions in favor of children was hindered by a theoretical preoccupation on the one hand, and by the increasing conservativism and dogmatism in administration on the other. If there were reasons for improving living conditions and thus preventing epidemics, or for supporting literacy and thus facilitating administrations there were also opposite interests. Misery guaranteed cheap working-power for the developing industry where the misuse of children of school age in mines and textile factories reached horrible levels in the eighteenth and nineteenth centuries. The belief that spirit has little to do with bodily health and environmental care, or that diseases are of devilish origin, was hardly influenced by the revolution in astronomic sciences ; it survived until the end of eighteenth century in many places, and delayed the development of scientific disciplines, such as pediatrics, child psychiatry, and child psychology.

Emergence of Developmental Psychology and Infancy Research

New universities and academies founded during the Age of Enlightenment represented solid crystallization centers for further intellectual and artistic progress. An Acdemy for Natural Sciences was opened in Halle in 1652, Royal Academies of Sciences were founded in London (1662), Paris (1666), Berlin (1711), and Petrograd (1711), Comédie Française came into being in Paris (1680), and Academy of Arts in Berlin (1696). Those cultural centers played important roles in the propagation of humanistic ideals, gradually reached relative academic freedoms, however, they could not directly and effectively change the structure of existing political systems.

Most European countries were politically preoccupied with intrigues among competing monarchistic dynasties whose conflicts together with Turkish invasions and expansive colonial politics provided a plenty of reasons for wars while leaving minimal latitude for attention to social needs of lower classes. Since the victory over Bohemian forces in 1621, two German dynasties were on the way to dominate Middle Europe and create empires in Austria and Prussia. However, the cultural heterogeneity of concerned territories caused additional, internal tensions.

In the meantime, however, an increasing resistance against social injustice grew in France. Advanced economists and sociologists criticized the unproportional distribution of privileges and national income from which the royal court alone was using more than one seventh although the entire feudal class represented less than one-half-percent and the entire clergy less than one-third-percent of the French population. The beginning of French social revolutions in 1789 found an enthusiastic echo in Middle Europe, where nations were just recovering from a period of Silesian wars (1740 to 1763). However, it took a long time to definitely install democracy in France, and Middle Europe again had

to first serve as a battlefield for escalating wars between Napoleon Bonaparte, and the coalition of Austria, Germany, England, and Russia. The final defeat of Napoleon in 1815 was followed by a restriction of academic freedoms and introduction of censorship in Germany in 1819. Only after further revolutions in France in 1830, 1848, Karl Marx's proclamation of the Communist Manifesto (1848), and the final defeat of autocracy in France in 1871, Middle European governments, too, were compelled to loosen absolutistic forms of rule. In 1848, the national minorities in the Austrian empire increased efforts for liberation under the leaderships of Garibaldi in Italy, Kossuth in Hungary, and Palacký in Bohemia.

It was not surprising under such conditions that the general problems of child protection and child education long remained a matter of interst to small groups of educated individuals or beneficial societies and gained on political significance only after the French revolutions. Even then, however, it was difficult to intervene. For instance, when the German Minister of the Education von Altenstein tried to loosen child slavery the Minister of the Interior seriously protested with arguments that the German industry could lose in competition with the British industry if it could not use women and children as working-power. Finally in 1839, the government prohibited the use of children under 9 years in mines, stampingmills, and metallurgical works. Children between 9 and 13 were not supposed to work more than 48 hours a week or in night shifts, however, it was difficult to control the measure during the entire nineteenth century. Similarily, the obligatory school education which had been introduced, for instance, in Prussia already in 1763 could only slowly be realized during the nineteenth century.

Child psychology emerged as a scientific discipline as late as at the beginning of the twentieth century, however, its lack was partly compensated for by increasing interest in mental development and health in medicine since the second half of the nineteenth century. The first children hospitals appeared in Paris (1812) and later in Berlin (1830), Vienna (1837), Prague (1842), Frankfurt (1845), Munich and Brno (1846), and Leipzig (1889). They quickly developed to educational centers of great reputation contributing not only to the knowledge of child diseases (for instance, Skoda, Rokitanski, or Mayr at the university of Vienna) but also to social care (for instance, Epstein in Prague) and care for mental development (Epstein's associate Czerny in Breslau). Contemporary family physicians and pediatricians used to be consulted in educational problems as well. Thus Czerny's book "The Physician as a Child Educator" (1908) met a broad interest. Czerny closely cooperated with an outstanding Russian pediatrician Krasnogorsky who significantly enriched neurophysiology while working with I. P. Pavlov in Petrograd and applied salivatory conditioning methods for studies of mental processes in children as early as 1907.

Since psychology originated in philosophy in Middle Europe, the medical roots of child psychology significantly counterbalanced the influence of speculative philosophical approaches while mediating scientific advance from experimental neurophysiology, developmental biology, and comparative biology. This contribution appeared particularly valuable in relation to later infancy research. The academic background, both historical and contemporary, in Middle European universities proved valuable for the fast development of child psychology at the beginning of the twentieth century in general.

In addition to the heritage of Comenius, the French encyclopedist Rousseau, John Locke, Pestalozzi, or Fröbel who were mentioned in the preceding section, further outstanding scientists of the nineteenth century enriched sciences with fundamental discoveries in Middle Europe. G. Mendel detected the laws of genetics, J. E. Purkinje excelled in neuroanatomy and neurophysiology, W. Preyer published his studies on the physiology of embryos (1885) and his pioneering work on "The Soul of the Child" (1882) which was based on a truly scientific diary with observations on his son's development from birth to three years. W. Häckel formulated his theory on the recapitulation of phylogeny during ontogeny (1886). W. Wundt, originally a physician, founded the first Institute of Experimental Psychology in Leipzig (1875). Kraepelin revolutionized psychiatry with scientific approaches to the causes of mental disorders, close cooperation with psychologists, and foundation of pharmacopsychology. S. Freud published his first studies of neuroses.

Although only a few names can be mentioned, they sufficiently illustrate the productive atmosphere in Middle European universities prior to the emergence of developmental psychology. Moreover, scientific societies and journals soon represented a large community of German speaking specialists. Thus they drew international attention to Middle European research and increased interest in cooperation, for instance, among Russian psychologists and neurophysiologists.

On psychological grounds, developmental psychology could early profit from achievements of several groups which became established at the beginning of the twentieth century both in Germany and Austria. W. Wundt elaborated voluntaristic concepts in Leipzig and paid attention to ethnographic approaches. In Berlin, Wertheimer, Koffka, Lewin, and Köhler applied holistic concepts in psychology, known as Gestalt-psychology. Köhler joined the Berlin group after a period of experimental studies on chimpanzee intellect on Tenerifa. The Viennese psychologist F. Heider drew attention to the naive concepts on psychological development as to prescientific, commonsense positions for the history of human thought. Heider carefully analysed the participation of those assumptions in naive psychology which had also been involved in scientific theories, for instance the assumptions of teleology, free will, or validity of personal experience. Interestingly, Kurt Lewin from the Berlin group went a similar way and strictly revised the construction of psychological theories beginning with prescientific philosophical concepts. Lewin applied mathematical laws and the dynamic laws of energy system as a base for the constructions of rigorous theories and made psychologists aware of the fallacy of confusing dichotomies, teleology, or essentialistic forms of classifications, used in the sense of Aristotelian philosophy.

Von Bertalanffy, a biologist and philosopher from Vienna, followed a somewhat parallel way and outlined fundamental concepts of development from the point of view of systems theory in relation to organismic systems, and with respect to specific features of human evolution and ontogeny. In concordance with Heider, Lewin, and holistic psychologists in general, von Bertalanffy did not accept pure empiricism and associationism which flourished in England and the United States at that time. On the contrary, he combined nativistic and empiricistic views in his interpretations of development. In this sense, the Piaget's theory was close to the Middle European positions as well.

Perhaps the most consequent organismic developmentalist among European psychologists was the Austrian psychologist educated in Germany, Heinz Werner. His broad knowledge of comparative biology, anthropology, embryology, and pathology stimulated Werner for attempts to explain the most global aspects of development from holistic and organismic views and led him to the idea of the "orthogenetic principle," according to which the process of development encompasses a gradual differentiation and hierarchical integration. Werner, too, saw interactions rather than dichotomies between, for instance, genetic factors and learning processes. He stressed the multiform character of development and objected against its reduction to single dimensions for the purpose of easier experimenting and quantification.

Interestingly, William Stern who worked with Werner in Hamburg introduced the intelligence quotient into child psychology as a measure of mental capacities (1912). William Stern with his wife also used observations of their own child for the study of psychological development which was published in W. Stern's "Psychology of Early Childhood" (1914).

Between the two World Wars, child psychology in Vienna attracted a particular attention due to the contributions of Karl and Charlotte Bühler, and their coworkers Hetzer, Schenk-Danzinger, and Wolf. Their interests covered the psychology of early childhood, the effects of social environment, and the development of speech.

It would be difficult to review the entire advantageous atmosphere in detail. The selected examples hopefully show that the situation in Middle Europe before World War II was mature to deliver a solid conceptual base for attacking the difficult problem of the earliest periods of development—human infancy. Clinical evidence suggested that the course of infancy might play an important, if not critical role in the entire human life. Infants, however, seemed to many researchers too fragile to be used as experimental subjects. Moreover, infancy represented a methodologically difficult area of exploration.

Unfortunately, the controversy between intellectual potentials and political blindness operated anew and more destructively than at any time before. Hitler's rise to power and World War II dramatically changed the entire stuation and left a deep gap behind. Many of the prominent psychologists just mentioned in this section emigrated in order to avoid racial or political persecution, others died or had to interrupt their activities due to various war events.

War experience drew attention to infancy from new aspects. Increased infant mortality required multiform medical interventions. Numerous cases of parent-infant separation called for clinical evaluations of psychological or psychiatric consequences. The mobilization of women for war industry necessitated organization of a network of day care facilities. The loss of millions of young men caused an increased frequency of fatherless, so-called unipolar forms of child rearing. These and similar factors speeded the development of infancy research.

In addition, the postwar technological revolution provided infancy researchers with new powerful equipments, such as electronic polygraphy for the study of various autonomic functions, electroencephalography, audiovisual recording and microanalyses of overt behaviors and vocalizations, spectrographic analyses of vocal sounds, unobtrusive ultrasonic devices for recording fetal behaviors in utero, and last but not least, computers.

The Present Situation in Infancy Research in Middle Europe

The conceptual heritage of the prewar Middle European psychology and developmental psychology certainly remained available and together with the postwar technological progress facilitated the fast development of infancy research. However, the political picture of Middle Europe changed. The "iron curtain" ideologically divided Europe into Eastern and Western halves leaving almost no space between them. Infancy research requires interdisciplinary and international cooperation by principle. The modern concepts of develomental precesses stress interactions rather than simplified dichotomies between opposing theories. From this view, iron curtains of any sort are medieval requisites, hostile to scientific and artistic interests of mankind, barriers against altruism. At present, however, one iron curtain makes it impossible to delineate Middle European positions in infancy resarch.

Interesting innovations improved the organization of interdisciplinary cooperation in infancy research on both sides of the iron curtain. Thus Eastern European countries could profit from the foundation of Academies of Sciences and a network of research institutes covering major scientific problem. For instance, K. Kubát organized a complex interdisciplinary approach to infancy research at the Research Institute for the Care for Mother and Child in Prague, Czechoslovakia. Well known are the studies on the early development of behavioral states (J. Dittrichová, K. Paul) and learning capacities in infants (O. Janoš, J. Koch, H. Papoušek) from that institute. At the same time the Charles University in Prague opened a special Medical School for Pediatrics under the chair of J. Houštěk where all medical disciplines were conceptualized from developmentalistic views and developmental psychology was introduced as a new, obligatory discipline.

A close interaction between comparative biologists and human infancy researchers has developed in the research institutes of the German Max-Planck Society and at the German universities. Human ethologists cooperating with K. Lorenz in Seewiesen turned attention to cross-cultural research on social and communicative development (I. Eibl-Eibesfeldt) and on the neurological regulation of behavioral development (H. F. R. Prechtl). Prechtl later founded an excellent research in developmental neurology at the Groningen University, Holland, and has significantly contributed to the knowledge on the regulation of behavioral states and motor behaviors in newborns, prematures, and fetus in utero. Psychobiological aspects of early social interactions and preverbal human communication have been studied at the Max-Planck Institute for Research in Psychiatry in Munich (H. and M. Papoušek) in a close cooperation with experimental primatologists (D. Ploog, S. Hopf, U. Jürgens, M. Maurus).

B. Hassenstein with coworkers at the University of Freiburg, Germany, also enforced the bridges between comparative zoology and research on child development. S. Schindler from the University of Salzburg, Austria, devoted much effort to yet another new developmental aspect—the prenatal psychology. New groups of child psychologists involved in infancy research appeared, among others, in Berlin (H. Rauh), Regensburg (K. and K. E. Grossmann), or Osnabrück (H. Keller).

The rise in developmental orientation is not just a fashionable "boom" but obviously a part of a spontaneous and very general response of humanity to the unprecedented

dimensions of both physical and moral disasters which were caused by the humanistic blindness and lust of power in political dictatorship during World War II. The ideological significance of the developmental orientation for a peaceful future of mankind has been philosophically stressed by C. F. von Weizsäcker in Germany.

In relation to a potential overpopulation of Earth and other ecological problems, it has also become evident that not the quantity but the quality of the next progeny should increase. The qualitative care clearly depends on a safe scientific knowledge of all intrinsic and environmental factors regulating human development. Thus it also depends on an unlimited freedom and sufficient resources for cultural cooperation by prlnciple.

Developmental ethologists (Immelmann) and child psychologists (K. Grossmann) at the Bielefeld University, Germany, initiated an unprecedented project of an international and interdisciplinary year (1977/78) of cooperation on "Comparative Ontogeny of Human and Animal Behavior." That project brought together many leading scientists from various countries and exemplified the significance of complex cooperation for modern developmental research. In the same vein, however, it documented the decreasing role of national differentiation in research.

Another reason which makes the geography of sciences difficult is the increasingly cosmopolitan character of present sciences in Western countries. The leading position in the organization of infancy research has been occupied by the United States soon after World War II, however, the American research has also absorbed a great deal of the European heritage, both conceptual, and personal. Thus the American colleagues sometimes recommend: "If you want to see Europe you have to cross the Atlantic River but do not cross it if you want to become familiar with European developmentalists."

MAIN THEMES IN EUROPEAN RESEARCH ON INFANT PERCEPTION AND COGNITION

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Introduction

My aim in this paper will be to provide a general overview and background to research on infant perception and cognition in Western Europe. I will not attempt to catalogue all the research projects underway, not least because I do not know them! Instead, I will briefly list the main European centres where research is being carried out and leave it to you to follow up these sources personally for detailed information about the variety of work being carried out.

The main part of my talk will be concerned with three themes in infant development research which are exciting great interest in Europe today and which constitute 'new directions'. The three themes concern:

(1) the prenatal origins of behaviour.
(2) event perception and its implications for early experience.
(3) social cognition in infancy.

Main Western European centres for infancy research.

First I will give you some background information on traditions of infancy research and a brief acquaintance with the geographical location of the major infancy research centres in Western Europe. There has been a long and distinguished tradition of research into infant development in Europe, dating back at least as far as Charles Darwin's studies of his baby son at the beginning of the 19th century. Darwin's studies were carried out as a means of investigating the origins of emotional expression and this theme continues until today. Preyer and Bühler in the 19th and early 20th century developed methods of naturalistic observation which were also developed in 20th century ethology by Konrad Lorenz also have their place in infant developmental work. A major European pioneer of research on infant perception and cognition in the 20th century was, of course, the Swiss psychologist Jean Piaget. His brilliant observations on his own three infants carried out in the 1930's continue to inspire many studies on cognitive development, based on a critical appraisal of his sensori-motor theory. Although research on each of the themes is carried out in many centres in the world, they seem particularly European in their theoretical

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motivation and empirical foundations and have been chosen for that reason, even if some of the evidence is decidedly "Mid-Atlantic".

The major European centres for infancy research with which I am familiar are as follow. As I mentioned earlier, the foundations of a theory of infant cognitive development were laid at Geneva, Switzerland by Jean Piaget. Today, his colleagues Andre Bullinger, Pierre Mounoud and Annie Vynter are continuing to study babies there.

One of the most exciting recent areas of research concerns the naturalstic observation of foetal movements using real time ultra-sonic scanning techniques. A major centre for this work is Heinz Prechtl's laboratories at Groningen and there are other centres, notably in Milan. This work has mainly been carried out by developmental neurologists and has major implications for psychology.

In France there is a very strong group of infancy researchers at various CNRS laboratories. The population of France is approximately 40 million and the French perceive themselves as under populated. Perhaps this explains why infancy research is flourishing and well funded. In Paris, Henriette Bloch has succeeded Eliane Vurpillot in directing research in sensori-motor development, Janine Beaudichon specialises in social development and Jacques Mehler specialises in the origins of language. In addition, Scania de Schonen in Marseilles has also contributed much information on the neuropsychology of early infant development.

The foundations of a theory of event perception were laid as long ago as the 1930's by Michotte in Belgium. This tradition was developed by Johannson at Uppsala in Sweden and empricial work in this tradition continues in Sweden by Von Hofsten. It is also taken up at many other centres, notably by Tom Bower and colleagues in Edinburgh, and at other centres in Scotland.

Research on infant social cognition has been carried out extensively in Edinburgh by Colwyn Trevarthen and by the Papoušek's in Munich. A major contribution has also been made by Rudolf Schaffer at Strathclyde, Glasgow, and by Bruner when he was at Oxford. Research on attachment theory has also been carried out in Europe, Bowlby's seminal work has perhaps been pursued most actively in recent years by Klaus and Karin Grossmann at Regensburg. I would say that this tradition is not as strong in Europe as in the United States, however. Although I will not be discussing medical applications it is also my impression that there is less involvement by psychologists in medical aspects of infant development, such as in management of premature baby units than in the USA.

Other smaller centres are scattered throughout Europe, for example there is a strong group of researchers in Rome working on the early origins of language including Virginia Volterra and Luigia Camioni. Work on the development of tactual perception has been carried on for many years at Grenoble, France by Yvette Hatwell. It is not possible to list all the individuals involved but there is no doubt that Western Europe represents a strong interest in many aspects of infant development and in particular a strong tradition in infant perception and cognition.

The prenatal origins of behaviour

Let me turn now to my first theme. As I mentioned earlier, the ethological tradition has given rise in recent years to naturalistic observation of foetal behaviour using the

new technology of real-time ultra-sonic scanning. The main centre is at Groningen where Heinz Prechtl directs research. Prechtl was a doctoral student of Konrad Lorenz and so you will understand why I have placed his work in the ethological tradition. I believe that his observations of foetal movements are among the most important recent discoveries because they lead to radically different views on the origins of development and to a quite different perspective on the status of the newborn.

Prechtl's description of foetal movement patterns

Information about the extent and importance of movement in the intrauterine environment is becoming available from real-time studies using ultra-sonic scanning. De Vries, Visser and Prechtl (1984) have evidence for 15 distinctly different movement patterns in the foetus by the 15th gestational week. Their descriptions of complex, well coordinated foetal movement patterns illustrate the point that sensori-motor activity observed at its origins, may lead to a better understanding of the nature of subsequent development.

Among the movements observed are isolated arm movements or leg movements which can be seen as early as the 9th gestational week, hand to face contact by the tenth week, head retroflexion by the tenth week and antiflexion by the twelfth week, and an integrated yawn and stretch pattern of the arms by the tenth week. The stretch pattern is described as follows:

A complex motor pattern, always at a slow speed, consists of forceful extension of the back, retroflexion of the head, external rotation and elevation of the arms.

The yawn pattern is described as follows:

Similar to yawn observed after birth; prolonged wide opening of the jaws followed by quick closure, often with retroflexion of the head and sometimes elevation of the arms. Non-repetitive.

The rotation of the foetus at ten weeks from one position to another is described as follows:

Rotation occurs around sagittal or transverse axis, complete change of position around transverse axis is achieved by complex general movement, including alternating leg movements which resemble neonatal stepping. Rotation around longitudinal axis can result from leg movemests with hip rotations, or from rotations of head followed by trunk. Total change in position can be achieved in as little as two seconds but may take longer.

Conjugate lateral eye-movements and downward eye movements are observed at around 18 weeks of age. These are a separate category from those observed in REM sleep, where the eyelids are closed.

The new technology of ultra-sonic scanning makes visible the spontaneous movements of the foetus in the natural environment for the first time. The character of these movements is surprisingly different from what we have been led to expect by the classical description of a limited number of reflexive movements elicited in the exteriorised foetus. Even the principle of cephalo-caudal development is breached by observing the foetus in the natural environment. Spontaneous activity is observed in the whole foetus with no privileged direction of development from head to tail! Futhermore, movement is differentiated from an early age into a variety of postures, movement synergies and

programmed sequences which may enter into the subsequent regulation of behaviour.

One implication is that the lack of obvious skill in most newborn behaviour may actually give a misleading picture of the origins of sensori-motor competence since the neonatal period is itself a time of transition from the intra-uterine environment. The characteristically unskilled movements of the newborn may at least in part reflect the need to adapt to a new environment. The developmental transition brought about by birth creates new possibilities for action in which the extent of movement, the additional weight of one's own body and the use of vision to control activity are all factors that did not exist before. Hence it is not surprising that we may characterise the activity of the neonate as limited since behaviour is in transition to a new form of independent movement in the world.

Starting from this perspective, the first few weeks after birth may be considered a period that bridges two states of adaptation, an earlier one which encompasses behaviours most suited to the intra-uterine environment and a later one involving adaptation to the extra-uterine environment with the possibility that there exist continuities between at least some of the organised action systems (e.g. stepping) which may be observed in utero and later action systems.

Event perception

This brings me to my second theme : event perception. Many theorists agree on the indissociability of action and perception. Hence, if recent evidence on complex behvioural organisation in utero is accepted, this can be considered to pave the way for a reconsideration of the perceptual competence of the neonate. The tradition of research known as " event perception " offers a framework within which to relate perception and action and a great deal of challenging research is emerging on this theme.

Until the early 1970's much research on infant visual perception was carried out using static stimuli such as checkerboards, schematic faces, or geometric designs. A lot was learned from these studies about infants' visual acuity, preference for patterned over plain stimuli, colour vision and other psychophysical parameters. Nevertheless, these studies imposed a particular theory of perception on the baby and ignored the fact that in the real world we must obtain information about the environment from an ever changing, dynamic flux of stimulation that impinges on all the senses. There has been a strong tradition of " dynamic " perception in adult psychology, especally in psychology of Michotte in Belgium, of James J. Gibson (1979) of Cornell University in the USA and Gunnar Johannson of Uppnala in Sweden. This approach is known as " event perception " (Johansson, Von Hofsten and Jansson 1980). Information can be generated by the moving objects in the environment, by the movements of the perceiver, or by the interaction of movements of object and observer. On the dynamic theory visual perception occurs by means of information available in the flux of stimulation.

Within this flux certain transitions reliably specify events in the environment and others specify the actions of the perceiving organism. For example, one object may occlude another through its own motion as it passes across a particular point of observation but the observer's own activities need not be involved in generating this sensory transformation in the visual array. Other forms of dynamic information actively involve

the observer, they are events that contain information derived from or implicated in the control of action.

The dynamic approach to infant perception has been pioneered by James Gibson's wife, Eleanor and her students at Cornell, by Claus von Hofsten in Sweden and by Tom Bower at the University of Edinburgh in Scotland. A rapidly growing number of studies has shown that even the youngest infant reveals remarkable abilities once the investigator takes a dynamic approach to perception.

When we observe one object occludes another we experience the event as a temporary disappearance of the hidden object, rather than an annihilation of it. The "permanence" of the object is one of the fundamental outcomes of event perception; the perception of permanence ensures continuity and coherence of experience through the many vanishings and reappearances of things in the field of view.

Bower (1967) was the first to suggest that babies perceive permanence. Infants aged 7 weeks were conditioned to suck on a nipple in the presence of a large red ball. The ball was then made to disappear by slowly moving a screen in front of it. Babies continued to suck, evidence that they perceived the conditioned stimulus to be "present" but invisible.

Further evidence that infants extract information for permanence from the dynamic transitions in visual information obtained through movement has been obtained quite recently. Kellman and Spelke (1983) used the habituation method to investigate infants' perception of occlusion. Four month old babies were repeatedly shown a display that looked like a swinging pedulum with its centre covered but which actually comprised two separate elements in common motion behind a screen. The decline in their attention (habituation) over repeated trials was measured. Then the occluding screen was removed and babies were shown one of two displays, either the two separate objects in common motion or a complete pendulum. The results demonstrated that four month old babies perceived the partially hidden display as a whole object moving behind the screen. When the occluding object at the centre was removed babies showed renewed interest in the display, as if they were not expecting to see two disconnected objects. In the control condition, where a single moving pendulum was revealed behind the screen, babies showed no recovery of attention. Their low level of attention to the unoccluded display showed that they had all along perceived the rod as complete and this was simply one further instance of the same event. The fact that dynamic information was responsible for perception of completion of the rod was demonstrated when the experiment was repeated with the same stimuli presented as stationary displays. Under these static conditions the babies showed no evidence of discriminating between the complete and incomplete rod. It appears that the rigid motion of the two parts leads the infant to perceive them as a single connected rod that is partially hidden. Permanence is also perceived after other types of perceptual transition, such as loss of illumination (Bower, 1982, Hood and Willatts, 1986). These studies suggest that infant perception is much more sophisticated than Piaget had supposed.

A recent study by Granrud et al. (1984) with babies aged 5 months shows the importance of dynamic information for depth perception in the young baby. This study capitalised on the tendency of babies, when given a choice, to reach and touch the nearest

of several objects or surfaces presented simultaneously. A randomly moving display of dots was generated by computer and shown on a television screen. By clever computer programming it was possible to create the appearance of depth at an edge by continuous deletion of one part of the visual texture by the remaining texture on the screen. That is, the picture on the TV screen gave the appearance of one moving surface sliding behind another and the position of the " uppermost " surface could be varied from the left to right or centre of the screen. Infants would reach to touch the part of the TV screen where the moving surface appeared nearer to them, as specified by the occlusion of one textured surface by another. A similar study was carried out by Kaufmann-Hayoz and Kaufmann in Berne, Switzerland (1984) with babies aged three months. Displays were produced in which the figure and the background had a similar texture made up of randomly placed dots. When the figure is stationary it is invisible against the background. However, movement deletes texture in the background and immediately reveals the form of the figure. Babies easily discriminated a butterfly shape from a cross when both were in motion against the textured background. Furthermore, they were able to recognise the static form if it was placed on a white background when they had previously seen it in movement, as if the information about shape had been encoded in memory. Slater, Morrison, Town and Rose (1985) have provided evidence that even newborn babies may perceive and encode shape from moving stimuli. It would appear that information derived from relative movement is fundamental in infant visual perception. These data suggest that babies use dynamic information obtained from the relative movements of objects in the perception of a world of spatially connected, separately moveable, whole, permanent objects in the first five months of life.

Biological motion

A line of research originating in Johannson's laboratory in Uppsala concerns the perception of biological motion. Biological motions are mechanically complex, animate movements such as walking or the movements involved in emotional expression. Johannson developed a method of studying the dynamic visual information implicated in biological motion perception known as " point light walkers ". Point light walkers are created by placing lights or luminous tape on the head, torso and limb joints of a person dressed in black who is then filmed in the dark while traversing a path normal to the observer's line of sight. Adults viewing the filmed dots in motion report a compelling experience of seeing a human figure walking. In fact, adults can recognize the characteristic patterns of movement of their friends, and they can often tell the gender of the walking person, just from the moving points of light, (Cutting and Proffitt, 1982). The same luminous points seen when stationary do not reveal anything to the perceiver (nor does a single frame of the film of the point light walker) which shows that the information is carried in the dynamic transitions of the moving display.

Recent evidence obtained in Europe and the USA shows that babies of 4 to 6 months are sensitive to biomechanical motions specified by point light displays (Fox and McDaniel, 1982; Bertenthal, Proffitt, Spetner and Thomas, 1985). Additional detailed studies of infants' perception of computer generated point of light displays have been carried out, (Bertenthal and Proffitt, 1984). In these studies computer generated " coher-

ent " displays are produced in which the points of light mimick a person walking and are placed at the position of the major joints. In an " incoherent " condition the lights are positioned off the joints and move randomly. The authors demonstrated that babies of three months more rapidly encodé " coherent " displays than " incoherent " displays. In another control experiment Bertenthal and Proffitt (1986) showed that infants do not discriminate an upside-down point light walker from random movement. Thus, it would appear that infants may be able to extract information about human movement from moving points of light, so long as the essential information for an upright, walking figure is retained in the computer generated display.

Bower (1982, p. 273) discusses an intriguing extension of this line of research. In a study of toddler's perception of point light walkers it was discovered that babies prefer to look at a point light walker display of a baby of their own gender than at a display of an infant of the opposite sex. The films were made in the standard way and showed a boy or girl toddler walking, bending and picking up an object. Bower suggests that gender typical differences in skeletal articulation may underlie this preference for the same sex display. There does seem to be a tendency for little boys to bend and pick up objects from the waist, while little girls bend at the knees. Perhaps this sex difference in babies' selective attention to biomechanical movement is based on gender typical movement patterns. Taking this line of research even further, Kaufmann-Hayoz and Jager (1983) present evidence that infants may obtain sufficient information from point displays to perceive faces. In this study, white dots were placed on the face of a woman wearing black make up. The adult was filmed while behaving as if interacting with a baby. The resulting film showed the dots in dynamic movement with no part of the face visible. Infants' habituation to this filmed display was compared with habituation to a film of random movements of a rubber mask that had been similarly prepared. The experimental data on habituation and emotional expressions during habituation, suggested that infants discriminated the movements of the face from the elastic movements of the mask.

Taken as a whole these results are consistent with the argument put forward by Bower (1974, 1982) and by Walker-Andrews and Gibson (1986) that what young infants first perceive are the superordinate aspects of perception. Faces, voices, emotional expression and properties of skeletal articulation are perceived in the world to arise at a unified, embodied source. People behave in a coordinated fashion, in ways that yield information that has superordinate, common properties revealed by spatio-temporal patterning. Infants appear to be able to detect these commonalities, even in minimal form (as in point light displays). Early perception captures the essential, abstract, spatio-temporal transitions that yield a unified, coherent experience of persons and matter in motion.

Intersensory events

As the previous examples show, not only do babies perceive events specified within a single modality, there is also evidence that they are sensitive to intersensory information. One of the earliest studies to show intersensory coordination was by Wertheimer (1961) who showed that an infant only 8 minutes old would turn her eyes toward a sound played softly in one ear or the other. This early demonstration of an innate link between vision

and audition has since been supported by a wide variety of research (see Butterworth, 1981 for a review) and again, a striking ability to extract information from the dynamic properties of sensory stimulation is revealed.

Kuhl and Meltzoff (1982) carried out a study in which 4 month old babies were simultaneously presented with two video-recorded faces to left and right. One face was shown repeating the vowel "i" and the other repeated the vowel "a". However, the baby heard only one sound track, to correspond with one of the visually presented vowels, in a randomly counterbalanced experiment. It was found that babies preferred to look at the face that matched the sound track, suggesting that they detect an intersensory correspondence between the auditory and visual information for the vowel sound. In a related series of studies, Meltzoff and Moore (1977), Meltzoff (1981) and Vynter (1984) have carried out extremely interesting research on imitation in newborn babies that may also be implicated in mechanisms of speech perception and production. These authors have shown that neonates will selectively imitate mouth opening, tongue protrusion and lip pursing movements. Imitation of "invisible" movements such as these may involve the same abilities as lip reading and this could be important in the acquisition of language. The dynamic approach shows that babies' speech perception may profitably be investigated as an inter-modal event.

Many further examples of infant event perception are reviewed by Gibson and Spelke (1983) which I have not had time to mention. The evidence suggests that event perception is not a modality specific process, rather it occurs by gathering of information from many sensory channels each attesting to the same external reality.

Perception and action

The dynamic approach to visual perception also enables us better to comprehend control of action. When the whole visual field is in motion movement of the observer in a stable visual space is specified. A number of studies have been carried out using the "moving room" technique, in which the whole visual environment is made to move in relation to the baby. Infants are tested inside a small room comprising three walls and a ceiling which can be moved above a rigid floor. Babies stand, sit or are seated with support in the room which is then moved relative to the infant so that the end wall comes toward or away from the baby. This movement of the room produces a flow pattern of visual information which corresponds to that which would ordinarily occur if the baby sways backwards or forwards. Several studies have demonstrated that babies maintain a stable standing or sitting posture through sensitivity to the visual flow pattern. They lose balance when standing or sitting in the moving room and their loss of balance is always appropriate to the direction of instability specified by the misleading visual flow (Lee and Aronson, 1974, Butterworth and Cicchetti, 1978). In fact, this information may even be important in gaining head control, one of the earliest postures to be mastered by the infant. Pope (1984) showed that babies gain control of their heads with respect to the stable visual surroundings at least as early as the second month of life. Thus, dynamic transitions giving rise to a total flow of the visual array serve to specify the movement of self and babies use this dynamic information to gain control of the succession of postures and the motor milestones they achieve in the first eighteen months of life.

Another example of the importance of dynamic information in the control of action comes from studies of the catching skills of very young babies. Von Hofsten (1982) reviews a series of studies in which he has shown that infants will manually intercept an object moving within reach on an elliptical trajectory. Babies will adapt the speed of their reach to the speed of the moving object. Even the nowborn baby will attempt an interception, although obviously the very young infant is not as spectacularly successful in catching the moving target as the 9 month old. This example of eye-hand coordination in the baby again shows that event perception is not modality specific. Visual information for object movement specifies the possibility of encountering the object on a conjoint kinaesthetically specified trajectory of the arm.

These examples show that visual perception is very important in the development and control of reaching and locomotion in the sighted baby. But what about the baby who cannot make use of this information through blindness? It is worth noting that theoretical advances stemming from the dynamic approach to perception offer the possibility of constructing prosthetic devices in which information that is unavailable through vision may nevertheless be substituted in another modality. Bower (1977) reported one such case in which a congenitally anopthalmic baby was equipped with a sonar device. The sonar was worn on the head and it projected a continuous stream of ultrasound onto the environment. Reflections of the sound were converted electronically to audible sounds which convey information about the properties of objects. For example, the texture of an object is reliably specified by the clarity of the echoed signal (a hard object produces a clear sound, a soft one a fuzzy sound), the amplitude of the signal specifies the size of the object (loud big, soft small), the direction of the object is given by differences in time of arrival of the stereo signal at the ears. After some practice in using this device the baby was able to reach and grasp objects, to place the arms as if to break a fall when lowered toward a surface and would even play peek a boo with his mother with great pleasure as his head movements brought her in and out of the field of the sonic guide. The dynamic approach to infant perception not only helps us to understand better the abilities of the normal infant, it also offers the possibility of developing new methods of helping those with sensory handicaps.

The study of infant perception has entered a new era. The move from static to dynamic theories of perception has revealed so much about the perceptual world of the very young baby that there is no going back to the old theory of limited perceptual abilities. Johansson (1985) said that his own studies of event perception led him to the conclusion that sensory systems are most efficient under conditions that are exceedingly complex to describe mathematically. By the same token, we may conclude that early infant perception is most efficient in the complex dynamic case.

Social cognition

In the few minutes that remain I should like briefly to describe some of my own recent research on social cognition. As I mentioned at the beginning many European researchers have been interested in the origins of social sensitivity, especially in relation to language acquisition. My own current programme of research is on joint visual attention or put very simply " How a baby knows where someone else is looking ". The

aim is to establish the very early precursors of referential cognition both in the comprehension of referential activity by the infant and in the production of referential gestures for others. A major contribution to the field from R. Schaffer is summarised in his book published in 1984.

Scaife and Bruner (1974) showed that infants as young as two months would readjust their gaze contingent on a change in the focus of attention of an adult. The phenomenon of joint visual attention draws attention to a social, inter-mental dimension of early experience.

Butterworth and Cochran (1980) and Butterworth and Jarrett (1980) made an extensive series of studies in an attempt to establish the mechanisms serving joint visual attention. The studies were carried out under strictly controlled conditions in an undistracting environment, with identical targets placed at various positions relative to the mother and infant. These conditions allow relatively unambiguous conclusions to be drawn concerning how the baby is able to single out the referent of the mother's gaze since distractions and other possible artifacts are eliminated. In these experiments the mother was instructed to interact naturally with the infant and then on a signal, to turn, in silence and without pointing manually, to inspect a designated member of a set of targets placed at various positions relative to the mother and baby around the room. Babies between the ages of 6 and 18 months were studied.

We found evidence for three successive mechanisms of joint visual attention in the age range between 6 and 18 months. At six months, babies look to the correct side of the room, as if to see what the mother is looking at, but they cannot tell *on the basis of the mother's action alone* which of the two identical targets on the same side of the room the mother is attending to, even with angular separations as large as 60 degrees between the target. Although the babies are accurate in locating the referent of the mother's gaze when the correct target is first along their scan path, they are at chance level when the correct target is second along the scan path. Furthermore, infants only localise the targets within their own visual field and hardly even locate targets which the mother looks at in the region behind the baby, out of view.

If the mother looks at a target behind the baby, the infant either fixates a target in front and within the visual field or does not respond. On the other hand, so long as all the possible locations are within the infants' field of view, they are capable of correctly locating targets presented one at a time at visual angles which introduce separations between mother and the referent of her gaze of up to 135 degrees.

At 6 months, therefore, joint visual attention is restricted to targets within the infant's view (i.e. to targets that are not occluded by the baby's own body). Within the field of view, accurate localisation of the referent seems to depend not only on the adult's signal but also on the intrinsic differentiating properties of the object being attended by the mother. The addition of movement to one of the otherwise identical targets, is sufficient to lead the infant to fixate it. This earliest mechanism of joint visual attention we have called " ecological ", since we believe that it is the differentiated structure of the natural environment that completes for the infant the communicative function of the adult's signal. What initially attracts the mother's attention and leads her to turn, is also likely, in the natural environment, to capture the attention of the infant. The ecological mechanism

enables a "meeting of minds" in the self same object.

By twelve months of age the infant is beginning to localise the targets correctly, whether first or second along the scan path, so long as the target is in the visual field. The only information allowing this is the angular displacement of the mother's head and eye movement. It is interesting to note that the infant fixates intently on the mother while she is turning, then when the mother is still, the infant makes a rapid eye and head movement in the direction of the target. The mean latency of response after the end of the mother's head movement is about one second (Butterworth and Cochran, 1980, p. 268). This brief interval may be sufficient for the baby to register information about the angular orientation of the mother's head. We call this new ability the "geometric" mechanism since it seems to involve extrapolation of an invisible line between the mother and the referent of her gaze, as plotted from the infants' position.

Despite this newfound geometric ability however, babies at 12 months still fail to search for targets located behind them. Again, we have carried out control studies in which the visual field is emptied completely of targets yet babies of one year do not turn behind them at the mother's signal. Instead, they turn to scan to about 40 degrees of visual angle and give up the search when they fail to encounter a target. It seems that if the geometric mechanism is available, it must still be restricted to the infant's perceived space.

By eighteen months babies are as accurate when the correct target is first along their scan path from the mother, as when it is the second target they encounter.

Furthermore, although the babies still do not search behind them when there are targets in the field of view, they will do so if the visual field is empty of targets. We found that head and eye movements to targets behind the baby would elicit turning to the correct target, so long as there was nothing in front of the 18 month infant, in the field of view.

In summary, we have evidence in the first eighteen months of life that three successive mechanisms are involved in "looking where someone elseis looking". The earliest, "the ecological mechanism", depends on completion of joint attention by the intrinsic, attention-capturing properties of objects in the environment, as well as on the change in mother's direction of gaze. At around 12 months, we have evidence for the beginning of a new machanism, a "geometric" process, whereby the infant from her own position extrapolates the intersection of the line of the mother's gaze with its intersection with a precise location in visual space. Finally, at sometime between 12 and 18 months, there is an extension of joint reference to a "represented" space which contains the infant.

In our more recent studies we have attempted to establish how the infant's comprehension of gaze may be related to comprehensitn of manual pointing. Manual pointing, the use of an outstretched arm and index finger to denote an object in visual space, is species-specific to humans and it is thought to be intimately linked to language acquisition. It is the specialised referential function that is of interest here since it is a particularly human type of social cognition. Could the comprehension of pointing be related to comprehension of looking?

There is a fairly sparse literature on manual pointing and it has been reviewed by Schaffer (1984). It is generally agreed that comprehension of manual pointing occurs toward the end of the first year, somewhat in advance of production of the gesture.

Looking where others point is observed in most babies by about twelve months (Guillaume, 1926/1962; Leung and Rheingold, 1981, Schaffer, 1984) whereas pointing for others is observed in most babies at about 14 months (Schaffer, 1984). Piaget (1952) considered comprehension of manual pointing to arise simultaneously with comprehension of other complex signs, between 10 and 12 months (e. g. p. 249).

Our own research on mechanisms underlying the production of pointing has only just begun and there is little to say so far, except that it clearly involves coordination of viewpoints, with the index finger "holding" the position of the interesting object while the baby checks to see whether the mother has located the referent. We do have quite extensive data on the infant's comprehension of pointing however which can be readily summarised. Infants at 12 months fail to locate targets behind them, whether the mother looks or looks and points. They can correctly locate the mother's referent target within their own visual field whether the target is first or second on their scan path. The main effect of adding the manual point however is significantly to increase the probability that the infant will respond. Adding manual pointing to simple change of gaze has a compelling offect on the infants' attention. The proportion of trials to which the infant responds when looking is accompanied by pointing increased to 96% (from 59% of trials when the mother only looks at the target).

In a later study Grover (1982) examined the development of comprehension of pointing at 6 months, 9 months and 12 months. The experimental laboratory and cameras were arranged so that the direction of the infants gaze, whether toward the mother's hand or to the referent target, could be precisely measured.

The results demonstrate that infants at 6 months and 9 months do not comprehend the manual pointing gesture. They are equally likely to fixate the mother's hand as the target to which she is pointing. By 12 months, 96% of responses are to the target and hand fixations are very few indeed. The 12 month infants have little difficulty in comprehending the manual point and they swiftly and smoothly look to the target being designated. They understand that they must look on from the hand toward the location in the visual field. By contrast, 6 and 9 month old infants, if they locate the target, do so relatively slowly, in a two-step movement in which they first gaze at the mother's hand for a second or two before moving onto the target.

These experiments are important because they demonstrate that quite extensive experience in responding to mother's direction of gaze in the first 10 months of life does not help the infant with comprehension of her manual pointing. An apprenticeship in "looking where someone else is looking" does not qualify the infant to "look where someone else is pointing". On the contrary, the evidence is much more consistent with the hypothesis that comprehension of looking changes from an "ecological" to a "geometric" mechanism and this aspect of *cognitive development* allows comprehension of manual pointing.

Taking the series of experiments as a whole, babies begin to comprehend manual pointing at about 12 months, the age at which the new "geometric" mechanism first becomes available.

This review of our research programme on comprehension of deictic gaze and manual pointing has provided a framework to examine the origins of social cognition in

development. Our observations are relevant to at least four issues (i) the status of perception in early development as a means of comprehending reality (ii) the relation between precocious abilities such as comprehension of gaze and later appearing abilities such as comprehension of pointing which are thought to be related to language acquisition (iii) the inter-mental aspect (in Vygotsky's terms) of cognitive development and (iv) the origins and status of childhood egocentrism which has usually been considered a limiting factor on cognition.

Our results make it clear that even the very young infant may enter into a communicative network with others through comprehension of an adult's direction of gaze; communication is not solely dependent on the greater cognitive sophistication of the adult. At 6 months, the signal value of the mother's head movement will indicate the general direction (left or right) in which to look. Communication occurs because the easily distractible baby will attend to the same attention compelling features of the objects in the environment as the mother. When seen in social context, the earliest "ecological" mechanism of joint attention allows communication in relation to publically shared objects through their common offects on intrinsic attention mechanisms of mother and baby.

A more general theoretical implication concerns the infant's comprehension of object permanence. The infant clearly takes the mother's action to signal the existence of a potentially interesting object somewhere in its own visual field. That is, although the infant will not search for hidden objects before 8 or 9 months, the mother's behaviour nevertheless signals the "permanent possibility of an object" potentially *within the field of view.*

During the first year joint visual attention remains limited to locations within the infant's own visual space. The baby behaves as if its own field of vision in shared with the adult and this gives us an insight into infantile egocentrism. On the one hand, the fact that the infant responds at all might suggest that babies are not egocentric, since a change in the other person's point of view has led them to respond. On the other hand, since under circumstances when the mother looks behind the baby, the infant assimilates her line of gaze into his or her own visual field, this might be taken as evidence for egocentrism. To resolve this paradox we need to move away form a solipistic theory of infant perception and toward a realist account. A theory of direct perception, such as that of J. J. Gibson (1979) enables us to understand that perception must originate at a particular viewpoint. This does not mean that the infant cannot perceive that others also have a perspective on [illegible] common to several points of view. The phenomenon of joint visual [illegible] ately possible because perception, even in the infant, presupposes a world [illegible] exist in a space that is held in common with others.

[illegible] on this basic mechanism, with cognitive development, comes precise [illegible] lisation of the referent of the mother's gaze, a development that simulta- [illegible] comprehension of manual pointing. The geometric mechanism lessens the [illegible] ference, since even targets that are identical in all respects except position [illegible] singled out by the infant. Once the geometric mechanism is avilable communi- [illegible] not require differential intrinsic properties of the objects being singled out, the [illegible] will choose the correct object in relation to the angular displacement of the mother's head and arm. In seems likely that this ability arises from a cognitive developmental

process of the Piagetian type, which allows invisible displacements to be monitored. Furthermore, this change also enables the comprehension of manual pointing, itself an important social means for re-directing attention.

Conclusion

In conclusion, our three themes from recent European research emphasise the degree of pre-adaptation of motor and perceptual systems. The unexpectedly complex activities of the foetus raise severe doubts about reflex models of early infant behaviour. Evidence from event perception in infancy suggests action and perception are intimately linked and that the infant may be pre-attuned to the dynamic proprties of sensory perception. Research on joint visual attention again suggests that the perceptual sophistication of the young infant enables proto-communicative interaction. Cognitive development in Piaget's sense is also implicated in the acquisition of geometric mechanisms that enable comprehension of pointing. The overall conclusion of the last twenty years must be that we are only now coming to realise the full extent of infant perceptual, motor and social competence and the ways in which these competencies enter into the process of cognitive growth.

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ESTABLISHING EMOTIONAL MUTUALITY IN JAPANESE CASES

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Introduction

The studies of Mahler on the separation-individuation process have shown that a happy stable symbiotic relation between mother and infant and "good enough" maternal availability are the prerequisites of a successful separation-individuation process (Mahler, Pine & Bergman, 1975).

In a country like Japan, where infants had long been cherished as "*kodakara*," treasures bestowed by heaven, motherhood had been a special privilege of women. A happy symbiotic relation between infant and mother was something naturally obtained through maternal preoccupation which was facilitated by the supporting network of women in the family and the community (Benedict, 1946).

The industrialization and urbanization after the Second World War, however, have transformed child rearing into a solitary task. It no longer is something monopolized by women shunning men, the toil and joy of it shared exclusively among women, but it is something that a young mother has to cope with alone. The ongoing liberation of women is furthering the current undermining of the social respect formerly given to motherhood. Therefore young mothers of Japan nowadays are facing the burden of child rearing in a contradictory state, bound up on the one side by the still existing image of traditional motherhood, and deprived on the other side of the physical and emotional resources necessary to comprise a holding environment for her infant.

Because of urbanization, more and more mothers live in tiny apartment houses without any communication with their neighbours. They rely on child rearing books, home doctors and relatives, but even when, for example, a grandmother is available, a young mother will not listen if what she says sounds old-fashioned. There is a deluge of new information flooding into their lonely lives through television, newspapers and magazines. For example, a child rearing magazine stated that mothers should start training children to read at the age of one. The more meticulous, unstable and lonely mothers easily fall prey to such harmful advice and suffer from what we call "*ikuji* (child rearing) neurosis."

Nuclear families have increased dramatically after World War II, but these families, although superficially westernized, in fact remain traditional in that they are child-oriented families, just as they were in olden days (Doi, 1962). Getting married still

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means having children, and there is an expression that " a child is a pledge of affection." The family is based not on man and wife but on the bonds that tie parents and children, and this is typically seen in the sleeping arrangements, for example. More infants sleep in baby beds today, but the beds are usually still placed in the same sleeping room with the parents.

Mothers in Japan still think along traditional lines of thought, that their husband's priority is to go to work every day, and that the longer he works the better (Makita & Okonogi, 1971). A popular television commercial says " A healthy and absent husband is an ideal husband." Thus mothers cannot rely on their husbands to share child rearing with them, and some mothers become more and more isolated. The role of the mother in post-war Japanese nuclear families has been to see to the upbringing and education of children. There is in Japanese an expression that translates roughly as "educational mom," and it seems that Japanese society itself is urging mothers to bring up more and more competent children by themselves. Success in this area brings with it social approval, and most mothers are concerned about their children's academic ackievement, regarding the competence of their children as a mark of their own competence.

Reflecting mothers' tendency to regard their children as a part of themselves, they urge their young children to be good in the eyes of others, often at the cost of creating what may be called the false self (Winnicott, 1965). Although Japanese mothers rarely use physical punishment as a means of socializing their children, they control their children with very effective but also harmful ways. They try to tone down their children's aggression not by understanding and neutralizing it but by suppressing it, by threatening abandonment through such words as " Shame on you," " See how people are looking down on you," and " You are not my child to behave in such a naughty way." Vulnerable toddlers and hypersensitive children easily abandon their assertion as individuals in their own right in order to defend themselves from the fear of abandonment.

In addition, the great ecological changes in children's environment have made child rearing more and more difficult : the low birth rate, the increase in traffic casualties and the decreasing numbers of playgrounds necessary for the growing children to foster outdoor play experiences with their peers. Futhermore, because of the keen competition to enter into good private schools, many children are sent to cram schools at an early age.

Such being the case in Japan today, more and more children are becoming emotionally disturbed, their symptoms ranging from psychosomatic complaints such as gastric and duodenal ulcers, to conduct disorders, neurotic symptoms, affective disorders, psychotic episodes and so on. We child pychiatrists thus have a complex problem to cope with. One of the most important tasks is to provide effective support to mothers suffering from the contradictions of modern life. As a partial solution, we urge other members of the family such as fathers and grandparents to participate more in child rearing, and we encourage parents to make friends with other families of the same generation so that they can eventually form a network of support systems to help child rearing.

In cases of more deep-rooted pathology formed through interactional failures in early infancy, a new therapeutic approach was put to practice in an attempt to cultivate emotional availability in the mother and to enable mother and child to establish the emotional mutuality not formed in infancy. I will describe about this next.

Hospital treatment for mother and child couples to establish emotional mutuality not formed in infancy

A Japanese mother is easily led into possessing guilt feeling when her child acquires mental illness. Listening to the mother's self reproach and plea of "Isn't there any chance of undoing my failure in the care of my child in infancy?" I was driven to devise a therapeutic approach which used regression as a vehicle to take the child back to its infancy and which assigned the mother the principal role of interacting therapeutically with the child (Balint, 1968).

Method of Approach

For the purpose of establishing the emotional mutuality not formed in infancy, four girls aged six, eight, ten and eleven were hospitalized with their mothers, one couple at a time. They stayed in a room of the pediatric ward where children under three received pediatric treatment with the mother's around-the-clock attendance. The duration of hospitalization varied from 2 to 5 months, the average being 3 months.

The girls shared in common the characteristic features of limited attachment behaviors in infancy and no assertiveness in the rapproachement phase. They all came from intact families. Their mothers were all free of symptoms, but all showed some kind of personality problems in their Rorschach tests.

At the beginning of the therapy the diagnostic evaluation of the child's problems was explained to the parents in detail. Each mother was told that the child's illness was a consequence of the interaction among constitutional, maturational and ecological factors. Each mother was assured that the appearance of psychiatric symptoms could be converted into an opportunity to undo the past failure through therapeutic regression.

The parents were then given an idea of what would happen in the course of the therapy through vivid illustration of the behavior of a symbiotic infant in blissful unity with the mother, and a conflictual toddler taxing her mother at the peak of rapproachement crises. I depicted each stage of development and suggested the way in which the child should be taken care of, using fables, metaphors, examples and anecdotes so that the mothers would have a clear idea of what they were going to do. I also showed emotional availability and interacted with the mothers with empathy and tenderness, in order to stimulate mothers' emotions and feelings psychobiologically.

The Course of the Therapy

The therapeutically induced regression in the four cases involved the following four phases in common.

1) The First Phase

Gradual but unmistakable changes occurred in the child's attitude towards her mother, as she perceived the mother's increased emotional availability. She began to interact with her more actively. Concurrent with this change was a transformation of the symptomatology, which included transient aggravation of symptoms and appearance of persecutory fantasies. The mother took notice of the child's response, became interested in this therapy and began to reflect on her previous interaction with the child.

2) The Second Phase

The first phase was followed by gradual furthering of the regression which finally appeared as the open expression of the child's feelings and the blooming of infantile behavior. The child became more and more infantile : speaking in a babyish way, drivelling, wanting to drink from a bottle or suck mother's breast, to be diapered, or to be hugged, dandled and fondled. These were demanded in an impulsive way, with the child bursting into temper tantrums when the mother hesitated or not responded accordingly. The child resembled a toddler in rapproachement phase.

This was the most trying and critical period for the mother, who needed intensive support of the therapist. I listened with patience and perseverance to the mother's tales of discomfort and distress resulted from the child's expression of anger. The mother was reassured that this discharge of impulses was the very proof that the child began to perceive the mother to be the person whom she could depend on to confide her innermost feelings. These feelings must have tormented her ever since infancy and she must have endured alone because her mother had not been available so far. The validating experience obtained through the mother's patient understanding would help the child become reconciled with her abandonment fear, anger and rage, resulting in relief and a secure feeling. The therapist's keenness in detecting the mother's aggressive feelings and extending warmth, empathy, assurance and validation was indispensable to stabilize the mother and child relationship. If the therapist failed the mother, the mother would fail the child. If the therapist survived and validated the mother's negative feelings, then the mother could do the same to the child, letting her reexperience infantile feelings in the ego-relatedness with the mother.

At this time it was necessary to monitor the child's aggression so that the child would not actually hurt the mother to the point that she felt like rejecting her child. To prevent this the mother was encouraged to motilize her spontaneity and creativity to neutralize the child's aggression. Sedatives were prescribed to the mother and/or the child at times.

3) The Third Phase

Having experienced the mother's acceptance and perseverance through the previous phase, the child now showed less aggressiveness and more trust and fondness to the mother, hugging, kissing and sometimes even licking her. The child resembled a symbiotic infant.

4) The Fourth Phase

The child, now quite satisfied with the affectionate mother, became less and less infantile and more and more independent. She seemed now to progress into a healthy separation-individuation phase.

Cases

1) KANA

Shortly after several days of hospitalization for pneumonia, Kana, a six-year-old girl began to have frequent spells of fainting with clinging movements of the arms.

Thorough physical examination failed to reveal any organic cause and because the fainting spells occurred only in front of the mother, the pediatrician suspected a psychologic cause.

Kana was the result of unwanted pregnancy after eight years of the parents' marital life without a child. In fact her mother had lost a boy through stillbirth in the first year of her marriage and had decided never to have a baby again. When she learned of her pregnancy she feared that she might loose her freedom and will have no time for her own. The mother was the youngest of three sisters in a family where the mother dominated, and she had no memory of a warm relationship with her own mother.

I observed the couple in the pediatric unit and noted a robot-like girl with a harsh aggressive mother. The mother knew me and somehow had trust in me and confided to me that the spells began to appear right after her return from the short hospitalization, when Kana grumbled for the first time in her life that her Mom was too strict as compared with other mothers. I suspected that the symptom must have been an expression of her fear of abandonment which must have arisen from the guilty feeling of having directed outward aggression towards her mother. The mother was shocked to hear that the superb manners of her child might be a sign of a character disturbance, but was willing to undergo the hospital treatment I proposed in order to establish a good emotional bond which Kana seemed to have failed to develop in infancy.

The mother followed my instruction to attend Kana at the bedside warmly, and the sensitive child responded by deliberately throwing a toy to the floor on the first day. The next day she threw another toy more violently, and the third day she shouted at the mother saying, "You fool!" At this the mother rushed to me breathlessly and was totally astonished at the child's misbehavior. I assured the mother that this might be the beginning of the loosening of the child's harsh superego and that it would be followed by increasing expression of her hitherto repressed primitive impulses.

Kana then began to express her needs to be hugged and caressed as well as becoming more and more demanding and aggressive. The mother began to understand Kana's need and began to respond with all her heart. Kana now began to use baby talk and jargon, drooling like a todder and indulging in a pacifier. Once when her mother rejected her wish to put on diapers she threw herself on the floor in a temper tantrum which lasted nearly an hour.

This was a truly trying period for the mother who had hitherto been dominating the child. I kept providing firm emotional support for her, intervening right on the spot whenever my help was needed. Gradually Kana began to show more affectionate behavior towards her mother, and on the second month of hospitalization she was observed contentedly on her mother's back, the two of them looking like a pair of koala bears.

At the end of the second month Kana began to show attachment towards other adult also, and was found actively playing with other small patients. By the middle of the third month she was a gay and happy girl spending more and more time away from her mother. The follow-up sessions after her discharge revealed a continuing good mutual relationship between the mother and the child.

2) YAE

Yae, an eleven-year-old preadolescent girl entered the hospital in an acute

psychotic state. This started one day when she was scolded at school for a trivial mistake. Two months before this, she had her first episode of the same kind, and underwent a thorough medical examination in another hospital which failed to reveal any organic cause.

Yae, the first child of a nuclear family of four, had been a quiet, tense and hypersensitive girl since infancy, always lonely and was bad at school. During infancy and childhood she never showed delight when her mother approached her. In stead she responded with repulsion and repugnance. At the time of admission to my department, Yae showed outbursts of archaic fears, whining incoherently all day and night. Onset of a psychotic process was suspected, and she was given haloperidol. The confusional state gradually subsided in one week.

At this time I considered that Yae would profit from hospital treatment with her mother for establishment of a stable bond with a mother figure.

It was characteristic of Yae that she became tense and uneasy when her mother came to attend her. She avoided her mother by going out of the room to chat with other patients, nurses and others in an unnaturally elated, and somewhat manic mood. Her mother was clearly disappointed at this, felt helpless and sought my help. I perceived that she was more fragile than she looked, and I decided to intervene a little to make Yae approach her mother, acting as a go-between for the parent and child. I noted that an exclusively close relation with the mother seemed to be too delicate an issue for Yae, who was hypersensitive and shy in a way. Ten days after the mother first came to stay, Yae got into her mother's bed with her mother sleeping in Yae's bed. Asked what it was like sleeping in her mother's bed the next morning, she answered in a tender voice, "mmmm.... it was cozy and warm there and mum's blanket smelt good." The next week she was found sleeping with her mother in one bed, putting her arms around the mother's neck like an infant.

Altough she tried to do her best for her child, Yae's mother never fully acquired a genuine quality in her maternal preoccupation, for she was always eager to confide her marital conflicts in which she accused her husband of mistreating her. The mother's Rorschach test revealed a weak basic trust and archaic aggression. My listening to her helped to partially alleviate and neutralize her aggression but did not lead to a fundamental resolution of the conflicts. I functioned as a buffer for her aggression and released Yae from becoming her mother's target. Yae eventually got rid of her symptoms, became fond of her mother, continued school in spite of her low achievement, became tomboyish and more care-free and was never found to be psychotic again in the five-year follow-up. Because of unstable elements in Yae's mother, I continued inviting her to my office for monthly follow-ups, in which she eventually revealed to me her distant relationship with her own mother. Thus I continued to act as a buffering agent for the mother and consequently for Yae. Yae visited my office and the pediatric ward whenever she felt her mother to be transiently unavailable, and in this way the treatment milieu continued to play its role as a holding environment for Yae.

Results

The whole picture of the mother and child relationship showed radical change in all four cases. They acquired emotional mutuality which was gratifying to both, facilitating

the growth of the child's personality and the mother's maternal capacity. The children who had been withdrawn, tense, timid and vulnerable turned into sociable, flexible and adaptive children. They all were free from their symptoms, which never recurred, and the development of severe psychotic processes seemed to have been avoided. The children continued to show the favorable outcome in the follow-ups of two to five years, including resiliency to new life stresses. All mothers regained self-confidence and became attractive as a person, having done their best for the children.

Regression, Interactional Circles and Transmission of Affect

It was noted that the following two factors arising from the vicissitudes of symptom development in the child provided an optimal timing and situation for the renewal of a good mother and child relation through therapeutic regression.

First, the very fact that the child became symptomatic indicated that regressive forces were already at work within the child (Loewald, 1982). Second, the onset of symptoms in the child worked as an eyeopener for the mother who had been unaware of her child's vulnerability. It naturally gave her a shock, making her feel guilty and leading her to reflect on herself. Out of her need to be relieved of her helplessness she turned to the therapist, willing to make up for the earlier interactional failure.

Establishment of good mutuality between the mother and the therapist induced remedial interaction of the mother and her child. The therapist, when she won the mother's heart could become an object for the mother to rely on and identify and then the therapist could act as a model of an affectionate trustful mother which the mother introjected. How the mother interacted with her child depended on her relationship with the therapist. When the mother felt that the therapist was emotionally available, perseverant and trustworthy, then the mother was able to interact in the same way with the child. If the relationship was spurious, the mother was likely to assimilate the therapist's response to what may be called the false self (Winnicott, 1965).

Once the mother's maternal preoccupation with the child switched on the mechanism of rewarding interactional circles between the mother and child, the mother became more and more involved, acquiring self-confidence and autonomy through her child's positive feedback. Then the therapist could sit back and enjoy the unfolding of the unique reciprocity of the mother and child dyad, letting Nature do most of the work in her creative way (Stern, Barnett & Spieker, 1983). It was considered feasible to assign the mother a therapeutic role, since the mother had a psychobiological bond with her child, could interact with her on an around-the-clock basis and had many more years of mother and child relationship ahead.

Each child reexperienced infantile feelings in her mother's embrace. Those feelings of conflict that had been isolated and had caused symptoms now bacame understood and validated by the mother's empathy. They became integrated in the child's personality, which allowed the personality organization to resume progression.

The treatment milieu and staff functioned as a holding environment and a support system for the mother and child dyad. Infants and toddlers receiving pediatric treatment acted as good stimulants. Other mothers helped and supported the mother at the time of distress.

The hospital treatment of the mother-child couples yielded valuable data. However, it proved in the long run to be pecuniary too expensive and psychologically stressful for the family members who remained at home. Therefore, the approach was shifted to an outpatient treatment basis. So long as the establishment of a therapeutic alliance between the therapist and the mother was trustful, weekly interview with the couple sufficed to keep the therapeutic process going. In this way, more than 60 dyads have been helped, in which the children's problems included obsession, anorexia nervosa and pre-psychotic states.

Conclusion

The results with the four cases treated by hospitalization indicated that the interactional failures of infancy which led to a psychopathological state can be reversed therapeutically with this specific approach of therapeutic regression at the time of the onset of symptoms. The emergence of reciprocity between the mother and child effected the personality of the child and the maternal capability of the mother through mutual stimulation. This approach, based on the recent infant research findings of mother-child interactional mechanism, also utilized the Japanese affinity for intimacy and regression. It proved effective in the management of psychopathologies rooted in early mother and child interactional failures.

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COMMENTS ON PRE-CONFERENCE WORKSHOP: NEW DIRECTIONS FOR INFANCY RESEARCH

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This was an unusually productive workshop because it was small enough that all participants had an opportunity to become acquainted and exchange views, and because of the high level of expertise and variety of viewpoints represented in the participants. It is an indication of the respect held for Professor Miyake and his colleagues that scientists from all over the world would take the time before the ISSBD meeting to convene in Hokkaido.

I will make an effort at synthesis and integration of four issues or themes that were brought out at more than one time by different investigators. One of these had to do with the systems approach to understanding the parent and child, a second with the functional versus assessment or psychometric approach, a third with situational and cultural correlates of temperament and attachment, and a fourth with early origins.

Hanuš Papoušek drew attention to the importance of the systems approach in the historical development of research on infancy, and reported his own research on the parent-child system, particularly intuitive parental capacities to support infant thinking and acquisition of speech, considered as an environmental effect. The systems approach would also indicate the need to consider the effect of the infant's or young child's efforts at thinking and speech on behavior of the parent. We may ask what developmental changes in the infant might play a role in eliciting the intutitive capacities of the parent? The infant's behavior is a part of the parent's environment, just as the parent's intuitive behaviors create an environment for the infant.

Further, Alan Fogel pointed out that we must also consider the dynamic nature of the system. The parent-infant system is a moving system. If the parent's behavior affects the infant, then it must be reset for interaction with a new state in the infant. J. McVicker Hunt referred to this dynamic interchange, back in the 1960's, as the "problem of the match (Hunt, 1966)." The parent must continuously adjust responses so as to provide a challenge for the infant, but at the same time carefully avoid overwhelming the infant. The infant, in turn, is capable of much more complex event perception when it is presented with stimuli of changing rather than static form, as George Butterworth pointed out in reviewing current themes in research being carried out in Western Europe.

At first glance it might appear that the assessment or psychometric approach is inappropriate to the study of a continuously evolving systems. This is true only if there

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Professor Bell chaired a symposium at the Pre-Conference Workshop.

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is a single assessment. The psychometric approach is not limited to a single assessment any more than the functional approach is. Furthermore, psychometric theory can teach us how best to shape and interpret measurements carried out in the functional approach. For example, some have questioned the meaningfulness of a relationship obtained between neonatal irritability (e. g. a summary of several repetitions of the RIS test) and later attachment, since the summary concealed considerable variation from one repetition to another. It was advocated that we study the bases for the variations before we conclude that there is a valid relationship between neonatal irritability and later attachment. Indeed, it might prove worthwhile to study these variations, but psychometric theory would tell us that the fluctuations in irritability between repetitions of the test may be *less* meaningful than the summary score. Whether or not we are carrying out assessments in a continuously evolving or static system, a given sample of behavior reflects (1) error variance, (2) variance specific to the measure, (3) variance that this measure shares with several other measures and (4) variance that this measure shares with all others of the same kind. The question is whether the variability shown by the infant is simply error variance, or a reflection of a basic change that should be studied further. If it is error variance, a variety of independent factors are converging to produce changes specific to a particular moment, few hours, or a day in the infant's life. For example, right now the infant may need a diaper change, be hungry because the last feeding happened to be brief, or be sleepy because some new endocrine system is coming into action for the first time. In the next moment, hour or day there may be a new convergence of factors, and the pattern of change between behavior samples may itself be heavily affected by error of measurement. Thus, an effort to trace out all the determinants of a single measure could very well lead to some rather mundane discoveries of little psychological value. This is particularly true of the neonate but also more generally true of all psychological measurement, as Epstein has pointed out in a series of articles dating from 1980 in the *American Psychologist* (*e. g. Epstein, 1980*). He has summarized considerable evidence that error of measurement is much more often than we have recognized to be the underlying problem in our efforts to characterize behavior. Fortunately, Miyake and Chen summarized several tests for reaction to interruption of sucking, as Epstein would recommend, and this summary score from the neonatal period indicated validity by a significant relationship to later attachment. It should also be possible to test the hypothesis that valid variance in the individual measures has been lost in the summary, rather than error of measurement, by comparing the correlations of the individual measures and later attachment with the correlation obtained using the summary measure.

Psychometric theory also tells us that summarizing a variety of different measures, not just repetitions of the same measure, has considerable value. Not only will error of measurement be reduced, but variance specific to each measure will be eliminated, possibly revealing a factor common to several or all of the measures. This may be a more meaningful measure than any of the specific measures considered singly. Karin Grossmann reported just such a finding in her own data and that of others. Kuno Beller also provided substantive reasons for summarizing across a variety of measures, in discussing the need to measure attachment with different paradigms. The latter might make it possible to attain a measure of attachment that is not specific to one paradigm.

From the foregoing it can be argued that psychometric theory is a valuable tool for the investigator studying infant development, a way of thinking about the task of measurement. There is little reason to expect that avoiding psychometric theory will lead to better theories or more dependable findings. More likely, if Epstein is right, failure to use this tool may simply lead to more contradictory and ephemeral results from our functional analyses.

We have already mentioned one theme that Butterworth has identified in Western Enropean research on infancy. One other theme concerns the renewed interest in early origins of behavior. Research at the University of Groningen and other centers has shown with ultra-sonic scanning that human fetal movements are remarkably well coordinated and organized. Along the same lines, research by de Lacoste at the University of Texas has indicated that sex differences in early fetal brain development may explain sex differences in language and spatial capability manifest in infancy and childhood(de Lacoste, Holloway & Woodward, 1986). Until these findings it has been assumed that these differences were a result of differential sex-role training. Both the findings from ultra -sonic scanning and on fetal brain development set some limits on Hebb's theory that action in the environment is necessary to organize the functioning of the central nervous system.

Ultra-sonic scanning may ultimately make studies of prenatal individual differences possible. In the meantime, it is encouraging that studies of the neonate and of temperament in older infants show promise of tracing the process by which congenital and genetic factors contribute to development. Kuno Beller reported a new approach to evaluating measures of temperament by examining situational and cultural correlates, and identified dimensions such as persistence, crying, fearfulness, and dependency that seem likely to affect attachment. Kazuo Miyake described a mechanism by which cultural factors and temperament interact in affecting attachment and later compliance. The Japanese culture emphasizes the importance of reflection and deliberation before taking action. Putting Miyake's observation together with some of Beller's dimensions of temperament, it would seem likely that an irritable or persistent infant (taken to mean demanding by the present author) would be in conflict with the culture at the outset. The next question would be " at what point in development would cultural values lead to parental behavior countering these infant tendencies ? " Further, " how could these temperament characteristics be countered ? " It seems likely that the Japanese mother would not pit herself against the irritable, demanding infant but, rather, would be tolerant and responsive, and only at a later stage of development exert pressure for restraint and delay of gratification. What is the mechanism by which she might be effective ? The mother needs a securely attached infant or young child, because it is easier to obtain compliance with an infant or young child that is securely attached and thus is motivated to please its caregiver. It is at this point in the inquiry that we can appreciate the importance of the research on neonatal irritability and later attachment security carried out by Miyake and Chen in Japan, Egeland and Farber (1984), and Crockenberg (1981) in the United States. The latter has reported findings indicating that irritable, demanding infants do attain secure attachment with mothers who are responsive to them (and who showed this orientation toward responsiveness prenatally). It is only the irritable infant with mothers who are not

responsive to them (either because of lack of interest, or lack of social and emotional support from adults) who fail to attain a secure attachment. Thus, infant temperament interacts with the nature of the mother's caregiving, and we have the exciting but challenging task before us of explaining why neonatal irritability predicts insecure attachments not only in the United States samples in which lack of maternal responsiveness was identified, but also in the Japanese samples. In the latter we would expect the mother to be very accomodating to the irritable, demanding infant.

In summary, the pre-conference workshop provided some provocative issues for debate, exciting findings, some indications that these findings may be fitted together, and challenges to take on the next tasks for both research and theory.

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THE DEVELOPMENT OF THE ORGANIZATION OF INFANT CRYING: A DYNAMIC SYSTEMS APPROACH

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A description of some aspects of the development of infant crying was presented by adopting a dynamic systems perspective. Of particular interest were (1) The temporal organization of individual vocalizations and pauses within one cry bout, in relation to the length of respiration cycle, and (2) The integration of vocalization, and other motor skills of the infant to form a system of communication and control in the early months. Contrast between some features of crying vocalization observed immediately after birth and at later ages was made. It was suggested that the dynamic systems approach was useful in understanding the development of crying as action, the construction of which started at the kinematic level and the final movement or action was a combination of patterned voices, in coordination with movements of limbs and body. Implications of this perspective for understanding development in other domains was discussed.

Key words: action; coordinative structure; dyanamic systems theory; infant cry

Introduction

Infant cry has attracted the attention of the investigators for obvious reasons. Not only is crying a matter of practical concern for the parents and the care givers, it also suggests other possibilities to psychologists and the medical professionals. For example, it has entertained great hope in providing clinical clues for making diagnosis of diseases and dysfunctions of central nervous system of the infants (e. g. Karelitz and Fisichelli, 1962, Wasz-Hockert, Lind, Vuorenkoski, Partanen, and Valanne, 1968, Golub and Corwin, 1982). Some psychologists argue that some aspects of infant crying are indicative of some characteristics of infant temperament and the maternal sensitivity in infant mother relationship (Bell and Ainsworth, 1972, Bates, Bennett-Freeland and Lounsbury, 1979). Infant crying also appears to some investigators in language development as a natural starting point for the achievement unfolded a few months later (c.f. Stark, 1980).

In this paper, a different viewpoint from those mentioned above will be adopted. The approach is based on the dyanamic systems approach (Thelen, Kelso & Fogel, 1987). In adopting this view, the development of infant crying is to be examined from the point of view of the development of the control of movement. This perspective is derived from contempory theories of motor control to "view skill as a multidimensional, emergent

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phenomenon" (ibid, p. 40). In the description that follows, the development of infant crying is considered to begin at the kinematic level of making adjustment between vocalization and respiration, and to end where vocalization is voluntarily controlled by the infant to serve not only as a means of announcing that something has gone wrong, but also as a means of proximity seeking and making more specific demands. The kinematic level mentioned above is not an arbitrary starting point, for the infant is born with the ability to respire and to vocalize. That is, vocalization and respiration can be regarded as two initial, basic units of behavior for our purpose here. In this connection our present task is to try to give an account of how the integrated action of crying as will be observed at a later age begins to be constructed out of the few given "units." Of course, the description has to continue beyond the starting point to cover the process through which crying becomes goal-directed action.

One basic and fundamental notion underlying the dynamic systems approach is that of "*functional synergy*" *or* "*coordinative structure*" (Easton, 1972). As a solution to the so-called degree-of-freedom problem, this concept suggests that coordinated movement is constructed from a limited number of some sub-structures each of which is in charge of only a discrete part of the final motor sequence. Central to this concept are several points such as the primacy of function in defining the constraints on the units of actions, the special systems quality of coordinative structures in which order and regularity emerge from the unique relationships among the elements, but are not readily predicted by the elements themselves (ibid, p. 43). Also much emphasized is the recognition that movement outcome could not be predicted by muscle forces alone, but was the ensemble result of both muscular and nonmuscular forces, including the inertial and reactive forces from the moving body and forces associated with contact with the supporting surface and medium (ibid). A final point concerning the nature of cooperative systems that has profound developmental implications is the nonlinearity of their modes of change. A frequently used illustration is the gait patterns of horses (Tuller, Turvey, and Fitch, 1982). The issue here concerns with whether the discontinuous transition is accomplished by, for example, switching to a new motor program or a gait prescription that exists in the CNS, as some traditional formulations will have it. The dynamic systems approach argues that there is no preexisting plans for the different modes, nor is the transition realized by some kind of switching. However, the phenomenon is commonly found in nature, in physical, chemical and biological systems. The phenomenon of discontinuous phase shift at critical point in a continuous scalar is to be understood as the inherent geometry and its organization as a dynamical biological system (Thelen, Kelso, and Fogel, 1987).

In recent literature, such examples as from facial expression movements, spontaneous stereotypies, the development of reaching, the development of hand gestures are given to illustrate the concept of coordinative structures and the dyanamic systems approach (see Zivin, 1985; Thelen, Kelso, and Fogel, 1987).

In this paper, an outline of the development of infant crying behavior will be sketched by applying some of the ideas derived from these theories. As a preliminary attempt, only two main points will be addressed, namely (1) The coordination of vocalization and respiration, and (2) The integration of vocalization and other motor and

cognitive skills into crying as an action.

Coordination of Vocalization and Respiration

Among the various aspects of infant crying, the observation to be made here is that the first qalitative change in the vocalization of the very young infant appears in the infant's capacity to coordinate vocalization with respiratory movements. Observations of the temporal organization of the birth cry vocalization suggest that it is characterized by (1) irregularity of vocalization duration, (2) segmentation of vocalization within one respiratory cycle, (3) relatively short bout duration in which the number of rhythmic vacalization is small. These features are especially obvious at the few beginning vocalizations of each bout. In addition, unlike crying vocalization observed a few hours or days later, birth cry vocalization tends to occur not at the beginning, but the end or the middle of a respiratory cycle. This is reflected in the frequent occurrence of extremely long vocalization, the lack of "audible respiration" and the prevalence of inspiratory vocalization. A further observation to be mentioned in this connecton concerns with the way the amount of time for vocalization and for inspiration is distributed within one respiratory cycle. As the first vocalization of birth cry tends to be very long, sometimes stretching over 7 or 8 seconds, the infant often tends to overtax its inspiratory capacity so that little or no time is left for inspiration neccessary for the next vocalization. This situation seems to be attributable to three factors: (1) The first is the fact that infant immediately after birth is not so skillful even at this vital task of respiration as it may soon becomes a few hours or days later. (2)The second is the fact that immediately after birth, vocalization tends to be triggered by startles, convulsion-like movements of the limbs or body (causing loss of balance) or by small irregularities of the respiratory movements. As these proprioceptive stimuli do not seem to be predictable nor is the newborn good at expecting and coping with them, the first vocalization tends to be executed without enough preparation. (3) Thirdly, the fact that once the first vocalzation begins, its temporal dimensions are fixed, as if a spring is set in motion. The extra force has to be dealt with ("absorbed") by subsequent respiratory and vocalization cycles.

A few hours or days later, the beginning vocalization of the infan's cry tends to be preceeded by audible respiration or by obvious air-drawing movement and the vocalization ended with enough time for the next inspiratory movement. As a result, vocalization duration tends to become less variable and no extremely long vocalization under normal circumstances. After the first few days, when extremely long vocalization does occurrs (as a result of acute pain stimulation), it is always preceded by strong expulsion of air.

Based on these observations, perhaps the birth cry can conveniently be termed *"passive crying mode"* to distinguish it from the *"active crying mode"* later on.

Since the vital capacity of the infant is more or less invariant (as a result of the constraint imposed by the anatomy of human infant) and the task of vocalization is a set task (in the sense that once the newborn infant is activated to made vocalization of a certain intensity and length, it has to continue to cry for some time), the infant is faced with a taxing task of having to fulfill the demands from both vocalization and respiration with limited resources.

The change from "passive crying mode" to "active crying mode" is brought

forth by the improvement in the way respiration is managed and in the coordination between vocalization and respiration. As these changes occur whithin a few hours or days, it seems reasonable to assume that practice, rather than maturation, is the main factor.

Integration at multilevels

The next issue to be discussed concerns with what is called one of the cardinal rules of development, namely that the spontaneous behavior of the infant contains the bits and pieces of adult voluntary action (Trevarthan, 1982, Thelen, 1985, p. 227).

Observations of birth cry behavior show that although some movements of the body or limbs, including hand to face or mouth movement, were observable preceeding the utterance of sounds, no particularly obvious pattern or state change seem to be associated with voclaization. However, on the second or third day, if not earlier, hand to mouth movement and head movement are frequently observed before and after vacalization, together with kicking or stretching which was also present at birth. It is not the appearance itself, but the apperance in a certain order, in relation to vocalization that is to be considered evidence of integration. Now, the infant would begin its crying by short adjustment of the respiration which becomes audible when reaching a certain rate, followed by several vocalizations which are irregular. The crying will either dimish or continue to build up by slightly shorter and regular series of vocalizations. At the end of this phase, vocalizations of longer duration (500 to 800 msec) appear, as if to set a model for later more sustained rhythmic vocalizations. At the end of a cry bout, the infant either becomes drowsy or falls into sleep or begins to move its limbs toward the face or mouth area (even when feeding time is yet to come). Failing to be satified, the infant begins again the sequence as described so far.

At two weeks, if not earlier, one addition which begins to be observable is the exploratory vocalizations. These are single inflected vocalization usually uttered after several phonated respirations and glottal plosives and before the escalated rhythmic full blown cry vocalizations. Another change of behavior at this time is a more complex structure of crying behavior sequence, consisting of repeition of short series of glottal plosives, phonated respirations and exploratory vocalizations, increasing in intensity and in the bout length each time, with short pauses during which infant's searching behavior (turning from side to side or orienting toward sounds) and listening were observable. The appearance of short pauses, searching behavior, listening and the increase in responsiveness toward sounds in the environment before the infant reaches a sustained rhythmic vocalization phase are supported by the infant's development in various domains such as its cognitive ability (in perceiving and discrimination), its ability for state regulation, and for holding the goal and working toward its attainment. The integration seems to suggest the completion of a more economic (therefore, effective) system for communication and control.

Conclusion

Both the progress from the passive crying mode to the active crying mode and the gradual integration of different elements at different levels illustrate the notion of coordina-

tive structure as proposed by the dynamic systems approach. To be granted, the above is too sketchy an illustration. The main purpose of this paper is to suggest that as are true with the cases of the development of stereotypies, reaching, manual gestures and facial expression, our understanding of infant crying can also benefit from the motor action theories.

In this model no mention was made about the role of the environment in facilitating or shaping the later outcome. The description attempted above focused only on the intra-organic aspects of the development. But what is the role of the environment in facilitating or eliciting new forms of coordinative structures? If the infant-mother dyad or the infant-mother-sibling triad, etc. can be conceived as developing systems, further insights can be gained by applying the dynamic systems approach. Indeed, this seems to be the message in Thelen, Kelso, and Fogel (1987).

Needless to say, further research will be necessary to substantiate the view proposed here. It is hoped that not only this will be accomplished in the near future but also that the approach will contribute to the understanding of development in other domains too.

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EXPRESSIVE BEHAVIOR OF JAPANESE MOTHERS IN RESPONSE TO THEIR 5-MONTH-OLD INFANTS' NEGATIVE AND POSITIVE EMOTION EXPRESSION

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This study presents descriptive data on Japanese mother-infant emotional communication in the home. It is the first phase of a longitudinal, cross-cultural study of socialization of emotion. Twelve Japanese mothers and their 5-month-old infants were randomly chosen from a longitudinal sample of 44 in order to develop a coding system. Analysis was carried by replaying the video and coding spontaneous emotional expressions of mothers and infants at home. For this report, both infants and mothers' hedonic tones were analyzed.

Main findings were as follows: Mothers seldom respond negatively to their infants' negative emotion. By contrast, mothers tend to encourage and sustain infants' positive emotion by expressing clearly positive or playful affect. Percentage of mothers' non response to each of infants' emotion expression varies: Lower percentage of infants' intense (cry) or clear (smile, laugh) expression tended to meet mothers' non-response than infants' slightly negative or slightly positive expression.

Key words: mother-infant emotional communication; negative and positive emotion expression

Introduction

Izard and Malatesta (1987) reviewed several cross-cultural studies and pointed out the cultural specificity of emotion socialization and the developmental role of very early instruction in emotion expression regulation. Caudill and Weinstein (1969) found that American mothers stimulated their infants more and their speech to the infants appeared

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to be directed at reinforcing the happy vocalization, while Japanese mothers' speech to their infants usually occurred in order to soothe them and put down their unhappy vocalization. Dixon et al. (1981) mentioned that early parent-infant relationships among the Gusii of Kenya were characterized by avoidance of eye-to-eye contact and restraint in playful interactions. The Gusii believe the "evil eye," therefore they avert gaze and use bland countenarce in interpersonal relationships. These findings suggest that cultural differences in socialization might be implicitly influenced by belief system each culture has to produce different styles of expression regulation.

The purpose of this study is to present descriptive data on Japanese mother-infant emotional communication in the home. It is the first phase of a longitudinal, cross-cultural (Japan-US) study of socialization of emotion, focusing on how infants' regulation of their expression is enculturated through the mother's behavior. In order to understand this process, it is necessary to gather data on maternal responses to different types of infant expressions and on the nature of the emotion expressions mothers display to their infants in the home.

Method

Subjects

Twelve mothers and their 5-month-old infants were randomly selected from a longitudinal sample of 44 (Table 1). They were participants in a Japan-US comparative study of infant emotional socialization.

TABLE 1

The number of subjects

5 month old	Total	First-born		Second-born	
		boy	girl	boy	girl
Longitudinal sample	44	15	11	11	7
		26		18	
Randomly selected for this study	12	3	3	3	3
		6		6	

Procedure

(1) Home observation of mother-infant emotional communication at 5 months of age

A total 90 minutes of spontaneous mother-infant communication in the home was videotaped using 2 cameras, one focusing on each partner. Each mother was instructed to behave as usual and to try to reduce their anxiety about being observed. The two camera operators and one observer made every effort not to interfere with the mother and infant's ongoing flow of behavior.

(2) Coding system for describing maternal and infant emotion expression

For this analysis, 30 seconds of every 2 and a half minutes were coded. The digital timer images superimposed on the tapes were used. Categories used for infants' facial and vocal expressions were as follows : (1) intense negative (e.g. intense cry), (2) negative (e.g. fuss, cry, or negative vocalization), (3) slightly negative, (4) clearly

positive (e.g. clear smile, or laugh), (5) slightly positive or neutral. Both the antecedent events and the mother's expressive and instrumental responses were recorded. Maternal expressions were rated for hedonic tones (negative, slightly negative, neutral, positive, and clearly positive) and quality (as playful, stimulating, or soft when relevant). These coding systems were tentatively developed by consulting Izard's MAX (1983) and Scherer's research on vocal expression (1982).

Three coders independently coded both the maternal and infant facial or vocal expression. With regard to disagreements, final decision was made after thorough examination and discussion among the coders.

Results and Discussions

(1) Mothers' different hedonic tones in response to their infants' negative or positive emotion

Mothers' types of response to infants' negative, slightly positive/neutral, or positive emotion expression were illustrated in Figure 1. Primary findings were as follows: Mothers almost never display negative affect to their 5-month-old infants except occasional empathic mock sad signals. When infants showed positive expressions, mothers tended to respond with the same expression with slight exaggeration. This was not true when infant expressions were negative.

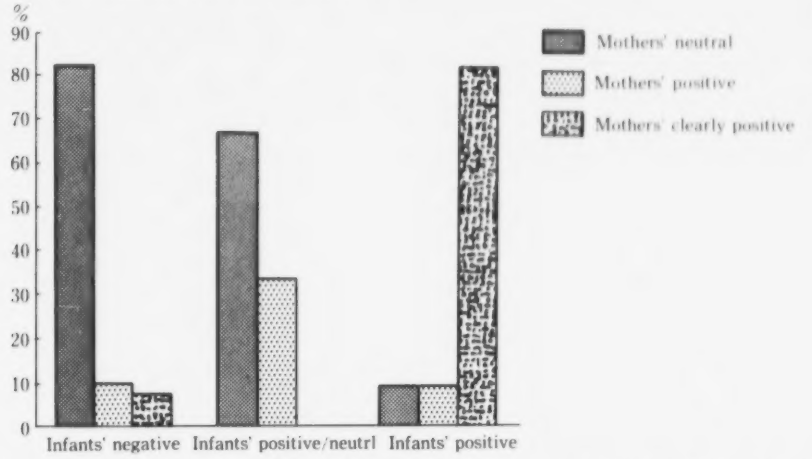

FIGURE 1 Japanese mothers' emotional expression in response to their 5-month-old infants' emotion expression.

(2) Mothers' non-response to infants' negative expression

The percentages of mothers' non-response to infants' negative vocalization and/or negative facial expressions and intense cry were lower than when infants showed other negative expressions (Figure 2). Low frequency of the infants' intense negative expression may cause higher percentage of mothers' non-response to them.

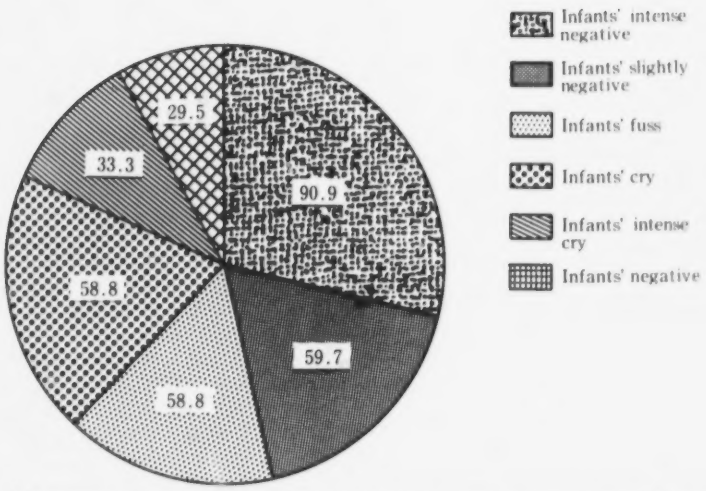

FIGURE 2 Japanese mothers' non-response to their infants' negative expressions. The numbers on the graph indicate the percentage of mothers' non-response to each of infants' negative expression.

(3) Mothers' non-response to infants' positive expression

As shown in Figure 3, the percentages of mothers' non-response to infants' interest (face) and slightly positive expressions (face and/or vocal) were higher than to infants' positive expressions (smile or laugh).

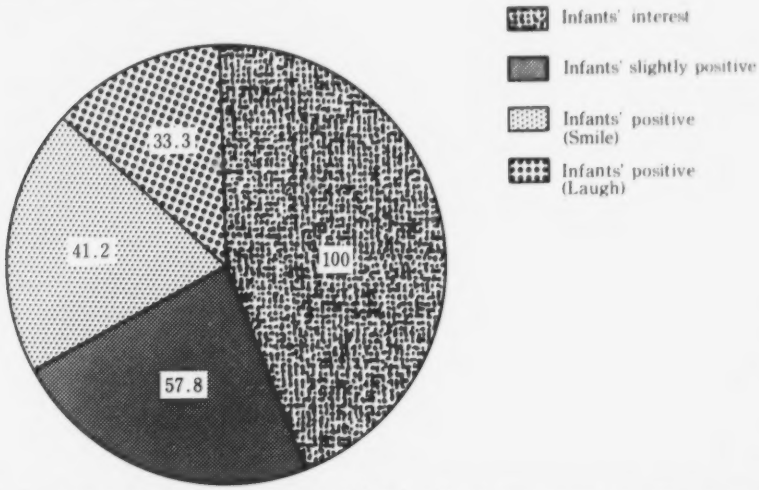

FIGURE 3 Japanese mothers' non-response to their infants' positive expressions. The numbers on the graph indicate the percentage of mothers' non-response to each of infants positive expression.

This suggests that mothers of 5 month-olds may tend to express clearly positive emotion in responding to their infants' positive emotion expression in order to encourage or sustain their infants' pleasantness. They seldom show negative emotion expression to any infants' negative signal, although they show some sad/sympathetic responses to

infants' distress, a finding consistent with reports from more structured observations. Rather than matching infant negativity, they displayed neutral or slight (but not intense) positive emotions to their infants' negative emotion as they played the role of modulator of their infants' negative emotion. As these findings were based on a small sample, we must examine the validity of the coding system adopted with larger sample and comparing samples from other societies.

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BEHAVIORAL INHIBITION AND SOCIAL EXPERIENCE OF 12-MONTH-OLD INFANTS

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The behavior of 12-month-old infants was observed in the labolatory in a sieries of situations designed to measure individual differences in the tendency to be behaviorally inhibited to the unfamiliar. Additionally, information concerning infants' social experience was obtained through interview with the mothers. Although for boys no significant relation between the tendency to be behaviorally inhibited and the amount of social experience was found, for girls the tendency to be behaviorally inhibited was positively correlated with the amount of social experience. The implication of this finding was discussed in the last part of this paper.

Key words: behavioral inhibition; social experience; sex difference

The purpose of this study was to examine the relation between laboratory observations concerning behavioral inhibition and the social experience of 12-month-old infants. The term "behavioral inhibition" refers to the tendency to withdraw from unfamiliar places, people, or events (Kagan, 1984). Many theorists have regarded this tendncy as a major dimension of psychological variation among infants and children (Bronson, 1978; Kagan & Moss, 1962; Stevenson & Lamb, 1979; Thomas, Chess, Birch, Hertzig, & Korn, 1963). This tendency has been increasingly regarded as a temperamental, or constitutional disposition (Buss & Plomin, 1975; Rothbart, 1981; Thomas & Chess, 1977). The evidence in favor of this hypothesis has been mainly reported by Kagan and his colleagues (Garcia-Coll, Kagan, & Reznick, 1984; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Reznick, Kagan, Snidman, Gersten, Baak, & Rosenberg, 1986).

I don't hesitate to agree to the proposal that biological factors are more important than social experience in considering behavioral inhibition. Nevertheless, I think it is important to examine the relation between social experience and the behavioral tendency to be inhibited to the unfamiliar. The correlational coefficients found in development studies, including Kagan and his collegues' works, were, at best, of the order of .3 or .4. Since it is commonly accepted that the square of the correlational coefficient indicates the percentage of variance in one variable that is accounted for by the other (Guilford, 1936), this means that less than 20 percent of the variance of a target variable was accounted for. This fact clearly shows that the approach to single out the most influential factor among some possibly relevant factors is far from perfect. Since even the most heritable charac-

teristics are subjected to environmental modification (Plomin, 1983), it is necessary to know the characteristics of the environment in which biological characteristics actualize.

It seems that there is no study which examines the relation between behavioral inhibition and social experience. The reason is perhaps that there is a tendency to regard temperamental characteristics as traits which are static and robust in the face of environmental changes. Therfore the investigators may think that a study of this kind is likely to find no relation or neutral but bored relation of these factors, for example, the more infants contact with people, the less inhibited. Speaking honestly, I was a member of those people before getting the results of this study. The result was contrary to my expectations.

Method

Subjects Forty-one infants of 12-months of age (18 girls and 23 boys) and their mothers served as subjects. They were subjects from one of the cohorts of the Hokkaido University Longitudinal Study (chohort 3).

Procedure All data were obtained in the course of two visits to the laboratory. On the first visit, all infants were observed in a series of five sessions with a female experimenter. The sessions are (1) warm-up, (2) free play, (3) reaction to unfamiliar adult, (4) reaction to unfamiliar robot, and (5) separation from the mother. Since these sessions were similar to what Garcia-Coll et al. (1984) reported, the details will be ommited here. Seven variables were selected as indicative of inhibition at 12-month-old infant. Although there were several ways to summarize these variables, the method used by Kagan et al. (1984) was adopted here. Each infant's standard score for each of the seven variables was computed, and the mean of these scores was utilized. This index has the merit of being more stable and unbiased than any other single variable, because by combining several variables, measurement errors of variables tend to be averaged out to zero. The variables chosen were (a) duration of crying and fussing during session One, (b) latency to smile, (c) latency to touch any toy, (d) latency to vocalize during session Two, (e) latency to approach an unfamiliar adult, (f) latency to vocalize during session Three, and (g) latency to approach an unfamiliar robot during session Four.

Two coders independently viewed the videotape recordings of the five sessions. The reliability was obtained by computing the ratio of agreements over the sum of agreements plus disagreements for each variable score of 10 randomly selected subjects. The reliability is over 85 percent for all the above variables. Since the valiables of session Five showed low reliability, They were not included here.

During the second visit to the labolatory, one week after the first, the mother was interviewed by a female experimenter not present in the first visit. At first, mother was asked to give an outline of infant's social life during the last one month. She was then asked the following questions: (1) what kind of persons outside the family did her baby interact with, (2) how did her baby interact with them, (3) how often did her baby interact with them, (4) where did her baby go out, (5) how often did her baby go out. Some fixed probes were included in cases where the mothers were not forthcoming in their answers. This semi-structured interview lasted about 20 minutes.

Result

Three indices of the infant's social experience were obtained from the records of interview : (1) the number of persons the infant interacted with, (2) the frequency of the interaction, (3) the frequency of the infant's going out. Table 1 shows basic statistics of these indices. There was no sex difference in the three indicies of social experience nor in the index of behavioral inhibition. In addition, there was no tendency for extreme scores to belong to either sex for any index. Table 2 shows the correlation coefficients between the three social experience indices and the index of behavioral inhibition. The latter shows sex difference : For boys, there is no significant correlation, but for girls, the number of persons the infant interacted with and the frequency of the interaction were both positively correlated with the index of behavioral inbibition ($r=.52$, $p<.05$; $r=.63$, $p<.01$, respectively).

For the whole sample, only the frequency of the interaction was siginificantly correlated with the index of behvioral inhibition ($r=.38$, $p<.05$).

Table 2 also gives the correlation coefficients between the three indices of social

TABLE 1

Means, standard deviations, minimum and maximum values for each index of infants' social experience within one month

Index	M	SD	MIN	MAX
Number of persons infant interacted with	15.12	9.11	3	44
Frequency of infant's interaction	66.76	35.56	6	169
Frequency of infant going out	28.58	16.12	2	66

TABLE 2

Correlations between the three indices of social experience and the index of behavioral inhibition

Index and variables	Number of persons infant interacted with		Frequency of infant's interaction		Frequency of infant's going out	
	boy	girl	goy	girl	boy	girl
Behavioral inhibition	−.05	.52*	.21	.63**	−.09	.01
(a) War-mup : Duration fussing and crying	−.15	.77***	.29	.85***	.13	.03
(b) Free play :						
Latency to smile	−.32	.21	.08	.35	.31	.27
Latency to touch toy	.06	.10	.27	.07	−.30	.13
Latency to vocalize	.02	.08	.02	.40	.01	.09
(c) Reaction to unfamiliar adult : Latency to approach unfamiliar adult	.38	.29	.06	.24	−.34	−.53*
Latency to vocalize	−.12	−.28	−.01	−.29	.06	−.05
(d) Reaction to unfamiliar robot : Latency to approach unfamiliar robot	−.01	.64**	.09	.64**	−.21	−.15

* $p<.05$ ** $p<.01$ *** $p<.001$

(a) (b) (c) (d) are subcategories of Behavioral Inhibition

experience and the seven variables which are comprised in the index of behavioral inhibition. For girls, the number of persons infant interacted with was positively correlated with the duration of fussing and crying during the warm-up session, and to latency to approach the unfamiliar robot ($r=.77$, $p<.001$; $r=.64$, $p<.01$, respectively). The frequency of the interaction was positively correlated with the duration of fussing and crying during warm-up session, and to latency to approach the unfamiliar robot ($r=.85$, $p<.001$; $r=.64$, $p<.01$, respectively). The frequency of the infant's going out was negatively correlated with the latency to approach the unfamiliar adult ($r=-.53$, $p<.05$).

For the whole sample, the number of persons the infant interacted with was positively, and the frequency of the infant's going out was negatively, correlated with the the latency to approach the unfamiliar adult ($r=.37$, $p<.05$; $r=.41$, $p<.01$, respectively). The frequency of the interaction was positively correlated with the duration of fussing and crying during warm-up session, and with the latency to approach the unfamiliar robot ($r=.54$, $p<.001$; $r=.33$, $p<.05$, respectively).

Discussion

These results imply that some aspects of infant's social experience in daily life are related to behavioral inhibition as observed in the laboratory. However, this seems to be true for girls only. In spite of the absence of sex difference in the mean scores of all indices, the degree of association between indices differed between the two sexes. This finding suggests that we should consider of the two sexes separately before considering them together. It is interesting to point out that the direction of associations found is the very opposite of what was expected: the amount of the infant's social experience was expected to be related negatively with behavioral inbibition.

It is difficult to explain why the amount of the infant's social experience was related to behavioral inhibition for girls only. Futhermore, to explain the positive relation between the amount of social experience and the degree of behavioral inhibition is even more difficult. Most of the adults have different goals, different styles, and different contents of interaction depending on the infants' sex. The fact that the sex of infants determines the nature of interaction can be important. It seems that in Japanese society the tendency to be behaviorally inhibited for girls is not as negative a quality as it would be for boys. Japanese culture has emphasized that a girl should behave modestly in public. In other words, the behavioral style the Japanese parents expect from their female children is consistent with the behavioral tendency psychologists call behavioral inhibition. If parents of girls hold this cultural expectancy, they might affect their female children to behave according to this expectancy, and they will tend to punish or get angry if they show boldness or fearlessness. Thus, as girls accumulate these negative reinforcement, they tend to show behavioral inhibition in public later on.

The above speculation is consistent with the view of Simpson and Stevenson-Hinde (1985). They found that in boys shyness was associated with negative family interactions but in girls it was associated with positive ones. They stressed the sex of child influenced the nature of interactions, and suggested that this influence was mediated through different expectations of behavior for boys and girls.

However, the causal link proposed above is only an example to explain the relation-

ship between social experience and behavioral inhibition. To find out the missing links, it is necessary to investigate parents' belief or expectancy, and the nature of parent-interaction.

In this paper focus was placed on the relationship between social experience and behavioral inhibition. The results sugessted that for gilrs most of the variation in behavioral inhibition may be explained by social factors. However, it is not the intention of the author to argue that instead of biological factors, social factors should take their places in the study of behavioral inhibition. It will be emphasized that in the study of infant temperament, resarch should be carried out within a framework in which not only the origins of the behavioral tendency but also their actualizing process in real social context are included.

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